GLOBAL FILE

REPORT No. 5

THE ELMWOOD GUIDE TO

ECO-AUDITING

AND ECOLOGICALLY CONSCIOUS MANAGEMENT

by

Ernest Callenbach,

Fritjof Capra, and

Sandra Marburg

Global File Reports is a series that summarizes successful ecological practices in business and government worldwide.

A project of the Elmwood Institute.

THE ELMWOOD GUIDE TO

ECO-AUDITING

AND ECOLOGICALLY

CONSCIOUS MANAGEMENT

by

Ernest Callenbach,

Fritjof Capra, and

Sandra Marburg

ACKNOWLEDGEMENTS

The authors wish to thank the following individuals for their contributions to this report.

German Research

Rüdiger Lutz

American Research

Lenore Goldman, Nicole Jordan, Regina Münch, James Warner

Translation

Petra Loesch and Francis Marburg

Design and Production

Janice Baker and Michael Weil

This report was funded, in part, by a grant from Esprit de Corp.

Global File Reports, No. 5, is published by The Elmwood Institute, P.O. Box 5765, Berkeley, CA 94705, USA; (415) 845–4595, fax: (415) 843–9398. Project Director: Philippa Winkler; Reports Editor-in-Chief: Ernest Callenbach; Reports Editor & Researcher: Sandra Lin Marburg, Ph.D.

© 1990, The Elmwood Institute

Printed on Recycled Paper

TABLE OF CONTENTS

Introduction V

Part I: THE CONCEPT OF ECO-AUDITING 1

Chapter 1. Origin of Environmental Audits 2
- Increase in Environmental Concerns 2
- Ecologically Conscious Management 4
- Benefits of Ecologically Conscious Management 5
- Expansion of "Auditing" Beyond Financial Data 7

Chapter 2. Methods of Environmental Data Analysis 12
- Quantity and Quality 12
- Methods of Environmental Auditing 13
- Methods of Ecological Auditing 13
- Case Studies 17

Chapter 3. Ecological Auditing 21
- Distinction between Environmental and Ecological Auditing: The Paradigm Shift 21
- Shallow Environmentalism and Deep Ecology 22
- Elmwood's Definition of An Eco-Audit 23

Part II: THEORY AND PRACTICE OF ECO-AUDITING 25

Chapter 4. Redefinition of Corporate Culture 26
- New Perceptions, Ideas and Values 28
- Systemic Management 28
- Corporate Goals and Strategies 29
  - Critical Analysis of Corporate Philosophy 29
  - Key Issue Analysis 30
  - Formulating Ecologically Oriented Corporate Goals 31
- Motivating Change 32
  - (1) Dissemination of Information 35
  - (2) Social Events 36
  - (3) Staff Involvement 36
  - (4) Incentives 37
  - (5) Recognition 38
  - (6) Support of Outside Environmental Projects 38
  - (7) Extension of Training 38
- The Organization of Ecological Management 39
- Expression: Advertising Policy, Product Design Criteria, Public Image 41

Chapter 5. The Company as a Living System 44
Metabolic Flow and the Organizational Chart 44
Metabolic Flow Chart 47
Organizational Chart 47

Chapter 6. Eco-Audit of Metabolic Flow 48
(1) Inflow 50
Checklist #1: Energy 50
Checklist #2: Materials 52
(2) Processing and Manufacturing 57
Checklist #3: Product Design and Development 57
Checklist #4: Manufacturing and Production 60
Checklist #5: Recycling 63
(3) Outflow 66
Checklist #6: Marketing and Sales 67
Checklist #7: Wastes and Emissions 69
(4) Structures Supporting the Flow 72
Checklist #8: Finance 72
Checklist #9: Investments 74
Checklist #2: The Workplace 75
(A) Working Conditions 75
(B) Human Relations 79
Checklist #11: Transportation 81
Checklist #12: The Physical Plant and Its Environs 83
Checklist #13: International Business Relations 87

Chapter 7. Action Plan: Priorities and Planning the Audit 91
Priorities in Ecological Management/Auditing 91
Business Priorities 91
Ecological Priorities 92
Personnel and Organizational Priorities 93
Human Health and Psychological Priorities 93
Planning the Audit 94
1. Definition of Audit Program 94
2. Top Management Commitment 94
3. Independence of Auditors 95
4. Proper Staffing and Training 95
5. Formal Audit Procedures 96
6. Reporting 96
7. Quality Assurance 96

Notes 97
Bibliography 98
Appendices 102

INTRODUCTION

This book was prepared the auspices of Global File, a project of the Elmwood Institute that collects, analyzes, and distributes information about successful ecological practices in business and government. In Elmwood's view, the nineties are a critical decade, characterized by a profound change from a mechanistic world view to an ecological view, from a value system based on domination to one based on partnership. The challenge of the nineties will be to create sustainable societies, i.e., social and cultural environments in which we can "satisfy our needs without jeopardizing the prospects of future generations" (Brown et al., p. 173).

Our first Global File report ("The Development of Ecologically Conscious Management in Germany") focused on Germany, one of the countries in which ecological awareness has progressed furthest among the general public, as well as in business and in politics. It discussed the concept and practice of ecologically conscious management by the German business community as an interesting illustration of what may be expected in other countries in the near future.

The present report carries these concerns forward and focuses on the practice of "ecological auditing" (or "eco-auditing") which is being recognized increasingly as an essential tool of contemporary management. This report refines and enlarges the conceptual framework of eco-auditing beyond that developed in Germany (and the mainly compliance auditing developed in the United States) and attempts to set new standards for this rapidly developing field.

This guide does not intend to give detailed directions on how to do an eco-audit. It is a *conceptual* guide which maps out the cultural and conceptual framework and sets the standard for eco-auditing. It also describes the corporate culture required to produce such an eco-audit. And it argues that only an audit of this "deep ecological" nature will really reduce the environmental impact of a company's operations. Finally, it outlines the dimensions and objectives of the eco-audit and provides general guidance for planning one.

However, to actually carry out an eco-audit of the kind described and advocated in this report, it is necessary to bring in, or identify within the company, auditing teams with various kinds of expertise (energy, chemicals, recycling, etc.). In their planning, these teams should consider using both quantitative and qualitative methods for conducting the audit. To give an idea of what these might be, we present a short menu of them. Some of these methods will be more germane to a given company than others.

The report is divided into two parts. Part I (Chapters 1-3) discusses the origin and conceptual framework of ecological auditing. Part II (Chapters 4-7) gives a detailed account of the theory and practice of eco-auditing advocated by the Elmwood Institute.

Chapter 1 reviews the origin of "environmental audits" in Europe and the United States during the 1970s and 1980s, the later shift from a defensive and reactive attitude toward environmental protection to a proactive and creative attitude in German and Swiss companies, and the principles of ecologically conscious management that resulted from the new creative approach.

Chapter 2 surveys various methods of environmental data analysis and discusses the problem of quantification and the relevance of values, which are central questions for all environmental auditing.

Chapter 3 introduces Elmwood's distinction between "environmental" and "ecological" auditing, comparing it to the distinction between "shallow environmentalism" and "deep ecology" coined by Arne Naess in the 1970s. Environmental auditing, from this perspective, lacks an ethical dimension, does not question the dominant paradigm, perpetuates the illusion of economics as a value-free science, and subscribes to the ideology of economic growth. Ecological auditing, by contrast, is motivated by an ecological ethic. It involves a shift from mechanistic to systemic thinking and from a value system based on domination to one based on partnership. It replaces the ideology of economic growth by that of ecological sustainability.

Chapter 4 deals with the redefinition of corporate culture, which is the basis of ecological auditing. Aspects of this redefinition (in theory and practice) discussed in this chapter include: new perceptions, ideas, and values; corporate goals and strategies; principles and techniques for motivating management and staff; organization of ecological management; and expressions of the new corporate culture.

Chapter 5 introduces the concept of the company as a living system with its internal and external ecology. This chapter contains a generic "metabolic flow chart" developed by the Elmwood Institute as a conceptual aid for comprehensive eco-auditing.

Chapter 6 applies the metabolic flow chart in a systematic discussion of the practice of eco-auditing. The chapter consists of four parts: (1) inflow, (2) processing and manufacturing, (3) outflow, and (4) structures supporting the flow. Each part contains several checklists combining elements developed in Germany with elements from practices elsewhere, plus some developed by the Elmwood Institute.

Chapter 7 describes the eco-auditing sequence and the resulting action plan, and discusses ways to establish priorities. It reiterates the essential point that eco-auditing and ecologically conscious management can only succeed if top management is fully committed to the process and to its continuing implementation.

PART I

The Concept of Eco-Auditing

– 1 –

ORIGIN OF ENVIRONMENTAL AUDITS

Increase in Environmental Concerns

During the 1970s and 1980s, the environmental disasters of Seveso, Bhopal, Chernobyl, and Basel led to a dramatic rise of environmental awareness throughout Europe, followed by an equally dramatic rise in the United States, where the Valdez oil spill infuriated the general public. Millions of people around the globe came together on Earth Day 1990 to symbolize efforts to "save" the Earth. Today, there is widespread agreement that the nineties will be the decade of the environment.

It is important to remember that the environmental damage done by the headlined catastrophes of recent years is small compared with the mostly unnoticed cumulative damage done by vast numbers of smaller polluters, most of them complying with the legal norms of their countries (Winter, p. 11). In West Germany, the following annual environmental damage has been estimated (Wicke, 1986; cited in Winter, p. 17):

Air pollution	over 48 billion DM ($27 billion)
Water pollution	well over 18 billion DM ($10 billion)
Soil damage	well over 5 billion DM ($3 billion)
Noise	over 33 billion DM ($18 billion)
Total Damage	well over 104 billion DM ($58 billion)

The overall figure of 104 billion DM represented approximately 6% of the West German Gross National Product (GNP) in 1984. No similar "ecological balance sheets" are available for other European countries, but the total environmental damage in these countries has been estimated by the Organization for Economic Cooperation and Development (OECD) at between 3% and 5% of the GNP.

Naturally, these estimates ignore a number of factors, either because they cannot be quantified and monetarized, or because the relevant ecological interdependencies are still unknown. It is likely that the true ecological damage is far greater than present estimates.

During the 1980s the awareness that "everyday" damages to the environment could be

reduced substantially by ecologically sound business practices spread rapidly in many European countries. West Germany, in particular, saw a boom in "eco-friendly" products and services.

The strong response of many elements in the West German corporate community to the environmental challenge must be understood against the background of three developments that shaped the German political landscape during the 1980s, specifically:[1]

- the rapid increase of environmental awareness in the general public, which had a significant effect on consumer preferences, and with it the rise of a powerful ecology movement;

- the emergence of technological protest, directed especially against nuclear power and other mega-technologies, as a new form of political protest;

- the rise of the Green Party and its successes in introducing critical ecological issues into the political dialogue and the legislative process.

These three developments combined to create a business climate in which the perceptions of the environmental dimension of business practices changed significantly in many German companies (Dyllik). Before the 1980s, environmental protection was seen as a very unwelcome, costly side issue that had to be avoided, usually by arguing that it would diminish a company's competitive edge. This reaction was defensive; its goal was to belittle, fend off, fight, or avoid all claims for environmental damage. In the 1980s, however, expenses for environmental protection began to be seen by leading companies not primarily as costs but rather as investments in the future and, paradoxically, as a competitive advantage. The defensive, reactive attitude changed into a proactive and creative one. "Ecologically conscious management" became the new catch phrase among forward-looking entrepreneurs (Global File Report #1).

With this dramatic shift, some German companies and the German ecology movement began a novel alliance. The experts, special communication channels, and financial resources of industrial firms were able to put into practice many "eco-tech" projects that had been conceived by environmental groups. Thus the initial antagonism between the grassroots ecology movement and the corporate world often turned into highly productive cooperation.

The change of perception among German business leaders is well documented by opinion polls. As early as 1984, a survey of the Association of Young Entrepreneurs found that 77% of respondents would welcome the incorporation of environmental protection into the German constitution; 75% intended to include more environmental considerations in their

production processes, while 60% were prepared to make economic sacrifices in the interest of environmental protection (Winter, p. 21).

By the time of the second Earth Day in 1990, environmental concerns were also seen to have a dramatic effect on consumer choices in the United States. In a survey taken in April 1990 (Opinion Research Corporation, *San Francisco Chronicle* July 3, 1990), 71% of those surveyed said they had switched brands because of environmental concerns and 27% said they had boycotted products because of a manufacturer's poor environmental record. We can expect that in the United States, too, more and more entrepreneurs will read the signs of the time and embrace the principles of ecologically conscious management.

Ecologically Conscious Management

To include environmental protection among management goals substantially enlarges the entire conception of management. The goals of management, traditionally, were almost exclusively economic. But since World War II, with the increasing integration of the social dimension into economics, especially in Europe, social goals—job protection, social security, worker participation, humane working conditions, etc.—were added to the purely economic goals. By the mid-1950s this had resulted in a significant extension of the conception of management, both in theory and in practice (Dyllik).

During the 1980s, the German conception of management was gradually extended further in many quarters to include the ecological dimension. At first this happened sporadically when individual managers and entrepreneurs started recycling programs, energy-saving measures, and other ecological innovations in their companies. These practices spread rapidly, and soon several business pioneers developed comprehensive, ecologically oriented systems of management.

The most successful of these comprehensive systems has been the "integrated system of ecologically conscious management" developed by Georg Winter, and known today simply as the "Winter model." On the practical side, several companies joined forces to form the Federal Association for Ecologically Conscious Management (German acronym BAUM, meaning "tree") for the purpose of promoting and refining the Winter model (see Global File Report #1).

Benefits of Ecologically Conscious Management

Winter lists six reasons why any responsible manager or entrepreneur should implement the principles of ecologically conscious management in his or her company (Winter, p. 21):

1. *Human survival*: without ecologically conscious companies, we cannot achieve an ecologically conscious economy; without an ecologically conscious economy, human survival will be endangered.

2. *Public consensus*: without ecologically conscious companies, there will be no public consensus with the business community; without such consensus, the market economy would be in political jeopardy.

3. *Market opportunities*: without ecologically conscious management, there will be a loss of fast-growing market opportunities.

4. *Reduction of risks*: without ecologically conscious management, companies face risks of liability for environmental damages potentially involving enormous sums of money and personal liabilities of directors, executives, and other staff members.

5. *Reduction of costs*: without ecologically conscious management, there will be a loss of numerous opportunities for cost reductions.

6. *Personal integrity*: without ecologically conscious management, both managers and employees will sense a lack of personal integrity and thus be unable to fully identify with their jobs.

Job satisfaction is bound to be enhanced with the awareness that one's work is being done with minimal expense to the environment, personal health, and the opportunities of future generations.

Implicit in this philosophy is the notion of sustainability, which has also become a key concept of the environmental movement in the United States (Brown, 1981). In the Winter model, this view is integrated into six principles that are considered essential for the long-term success of a responsibly managed company (Winter, p. 22):

- quality
  A product is of high quality only if it is manufactured in an environmentally benign way and if it can be used and disposed of without causing environmental damage. [In Elmwood's view, this formulation

is somewhat naive, since all industrial activity causes environmental damage; the objective is to *minimize* damage.]

- creativity
  The creativity of the company's workforce is enhanced by working conditions that respect human biological needs (low noise, healthy food, ecologically oriented architecture, etc.).

- humaneness
  The general working atmosphere will be more humane if the corporate goals and strategies are geared not only toward economic success but also toward a sense of responsibility with regard to all forms of life.

- profitability
  The company's profitability can be increased by adopting cost-reducing ecological innovations and by exploiting market opportunities for ecologically appealing products.

- continuity
  In the interest of the company's continuity, it is becoming more and more important to avoid liability risks under increasingly stringent environmental legislation and market risks resulting from the decreasing demand for environmentally damaging products.

- loyalty
  Ultimately, the staff of a company will be loyal to their country and fellow citizens only if they are emotionally attached to it, which will only happen as long as the country has not lost its character through environmental destruction.

The Winter model includes the strategic use of traditional management tools for ecological purposes (Winter, p. 23). Thus ecologically oriented managers use the special, often international, channels of communication available to them, as well as their influence in chambers of commerce and professional organizations. The effectiveness of management teams, trained and experienced in setting targets and making sure that they are achieved, is extended to the environmental context. Employee creativity can be mobilized for ecological activities, e.g., through employee suggestion schemes.

Three key elements are characteristic of ecologically conscious management strategies (Dyllik):

- innovation
  In contrast to traditional capital- and labor-saving innovations, ecologically conscious strategies require "eco-friendly" and resource-conserving innovations. Such ecological innovations may be of two kinds: those reducing the environmental impact of the company's operations, and those bringing the customer ecological advantages. The former will generate cost savings, the latter competitive advantages.

- cooperation
  The importance of cooperation among the actors throughout the life cycle of a product, from raw materials through production, use, and disposal, derives from the fact that economic and ecological effects obey different laws. Whereas competition is a guiding principle of the former, cooperation is essential to the latter.

- communication
  In traditional management strategies, communication and public relations are understood as components of marketing and restricted to product or image publicity. In ecologically conscious management strategies, by contrast, the task of communication acquires overall strategic importance, due to the crisis of confidence affecting individual companies and entire industries.

Expansion of "Auditing" Beyond Financial Data

All economic activities have impacts on society and the environment and thus generate social and ecological costs. In conventional economics, no matter how massive these costs may be, they are treated as "externalities." They are excluded from the balance sheets and passed on around the system to the population at large, to the environment, and to future generations (Henderson, p. 12).

In the late 1960s, this insulation of business from its real-world context came under heavy criticism in many industrial countries. Following the student and worker revolts in France in 1968 and the black uprising in Watts, Detroit, Washington, D.C., the operations of business as well as government were subjected to new levels of scrutiny and protest. Informed critics of business such as Ralph Nader and the Council on Economic Priorities began to focus public attention on a range of new corporate issues. Most prominent were: hiring and promotion of minorities and women, pollution, product quality and safety, and community responsibility. The viewpoint spread that a corporation's "constituency"

included many other players besides stockholders: employees, consumers, suppliers, communities in which operations were conducted, government, and society as a whole.

By the early 1970s, attempts were being made to think about "social accounting"—evaluating the performance of companies on more than simple financial grounds (Bauer). Some of this work was done by business-school analysts, but several American companies developed internal surveys of their performance which were called "social audits" and the notion of an "Environmental Exchange Report," on the analogy of cash-flow reports, was developed (Corcoran and Leininger). In Germany and Switzerland during the late 1970s a similar broadening of the traditional balance sheet took place (Müller-Wenk, 1978 [also 1980], cited in Steger, p. 317).

In the beginning, one social issue was susceptible to quantitative treatment: the hiring, retention, and promotion of minorities and women (later extended to include other categories of workers). Government regulations required corporations to compile yearly numerical reports on their performance in this area, and this provided some degree of objective standard for comparison and evaluation.

At the same time, a profound change in American public attitudes about the need for federal environmental standards (partly a response to Rachel Carson's *Silent Spring*) put pressure on politicians to act. Pivotal legislation adopted in the late 1960s and early 1970s not only established the Environmental Protection Agency but also set nationwide policies for emissions and discharges, environmental impact assessments, pesticide use, etc. With the rise of these national and similar state standards, quantitative assessments of impacts on air, water, toxic levels, and health standards became widespread. These combined developments led to what we term "environmental auditing."

Some American companies have developed internal policies on environmental matters that go beyond the meeting of governmental regulatory requirements. However, in American environmental auditing, the fundamental method involves comparing company procedures (in such matters as storage facilities for environmentally hazardous materials, emissions of wastes to air and water, etc.) with what is permitted by a complex of laws and regulations. These include:

Clean Air Act

Clean Water Act

Resource Conservation and Recovery Act

Comprehensive Environmental Responsibility, Cleanup and Liability Act ("Superfund")

Safe Drinking Water Act

Toxic Substances Control Act

Federal Insecticide, Fungicide, and Rodenticide Act

Surface Mining and Reclamation Act

Community-Right-to-Know Law

Occupational Safety and Health Acts may also bear on environmental factors. Moreover, the Securities and Exchange Commission has demonstrated a compelling interest in auditing, since it may affect the valuation of companies whose stocks are traded publicly.

A few American companies continue to rate themselves on social performance, partly to meet internal management concerns and partly for public relations purposes. The Council of Economic Priorities has greatly expanded its work; it now publishes the widely read consumer guide, *Shopping for a Better World*. This guide is based on extensive questionnaires and direct research, and rates companies on: charitable giving, women's advancement, minority advancement, defense contracts, animal testing, social disclosure, community outreach, nuclear power, South African involvement, and environment.

Most environmental auditing carried out by companies in the United States to date reflects a defensive and reactive attitude. In American auditing practice, "environmental" usually carries an unspoken modifier of "as defined by law." Thus, if Congress or other bodies have not yet included an environmental impact in the purview of a law, it is generally ignored (unless major financial risks are present). American "compliance auditing," as it is often called, is directed toward compliance with federal, state, and local regulations and toward avoidance of legal liability. Such auditing developed earliest and most professionally in large corporations, especially those in industries whose discharges and emissions early came under scrutiny and regulations. Most large waste-generating firms now have internal audit programs and/or make use of outside auditing services.

American corporations still tend to see auditing in a relatively legalistic and narrowly technical perspective—as a means of fending off fines and lawsuits, and as a means of preparing to deal with government regulations which may require high-level management attention and sometimes serious corporate investment. People working in the auditing field sometimes speak of aiming to improve management "comfort" through assurance that systems to monitor and control defined environmental impacts are in place and operating well.

As one American textbook lists them (Cahill, *Environmental Audits*, 1987), typical U.S. corporate objectives for environmental auditing are the following:

- assurance of compliance,
- definition of liabilities,
- protection against liabilities for company officials,
- fact-finding in acquisitions and mergers,
- tracking and reporting of compliance costs,
- information transfer among operating units,
- accountability of management.

Since the mid-1980s, it has been the practice of the U.S. Environmental Protection Agency to strongly encourage serious auditing efforts by corporations; these are taken by the Agency to signify good-faith attempts to reduce environmental impacts, and evidently tend to secure relatively generous treatment by the Agency when infractions are discovered and consent decrees are being negotiated. A company's established auditing program also may make EPA oversight and inspections more efficient in a period when its budgets have been tight. In addition, it is believed by many in EPA that the "proactive" approach embodied in auditing programs makes environmental catastrophes much less likely.

Some American environmental auditing is carried on with tight security, closely supervised by the corporate legal department; this is to guard against public disclosure of information which may embarrass the company or leave it open to lawsuits. In such situations, audit reports are tightly guarded and made available only to top executives; sometimes they are given only orally.

There are, however, many American companies which distribute audit reports fairly widely to management, and there are notable cases, such as public utilities, which must maintain open relationships with their public utility commissions and thus make their reports easily available.

In the United Kingdom, most environmental audits, especially those done by large consulting groups, are commissioned by U.S. companies operating overseas. As in the United States, virtually all of this auditing is compliance auditing (Elkington). The basic stance of these companies is still defensive. The shift of perception that occurred in a considerable portion of German management over the past decade has not yet happened in British companies.

Environmental Data Services Ltd. of London has reported on the environmental performance of companies for over ten years. Although these company profiles are not formal audits, they provide an excellent indication of how an external organization can monitor industry's environmental performance (Elkington, p. 61). In the United States, the imple-

mentation of the Valdez Principles by the Coalition for Environmentally Responsible Economics (see Appendix B) should have a similar value. CERES seeks to have companies adopt the Valdez Principles of ecological responsibility, then monitor and report on their implementation.

The International Chamber of Commerce has taken a leading role in championing environmental auditing, but a quick glance at the 1988 ICC pamphlet, *Environmental Auditing*, indicates that it limits itself to compliance auditing. Moreover, perhaps anticipating more stringent regulations and public scrutiny, the ICC paper insists that it is "essential that the procedure should be seen as the responsibility of the company itself, and should be voluntary and for company use only" (ICC, p. 12).

As will be apparent from the preceding materials, environmental audits of this type are an essential step in minimizing the most serious and massive environmental impacts of modern industry. These American practices are already being adopted to some degree in Europe. We believe that all responsible governments should create or extend environmental regulations so that auditing of this type will be adopted as rapidly as possible in all corporations operating throughout the world. However, they are unlikely to result in new or creative thinking about large aspects of a company's operations. For this, innovative methodologies are needed.

–2–

Methods of Environmental Data Analysis

Quantity and Quality

All ecologically oriented management practices, and auditing in particular, require a reliable information system on ecologically relevant data, beginning with a record of the environmental impacts or costs generated by the company's operations. And here we encounter a problem central to all methods of ecological data analysis. Most ecological impacts cannot be quantified precisely, since they affect the quality of life—human and non-human—which is basically determined by value judgements although measurements can be useful in assessing them.

Conventional economics, and the discipline of business administration in particular, has traditionally been presented as a value-free science, even though values are of paramount importance for all social sciences (Capra, p. 190). Instead of dealing with values, business traditionally attempts to equate values with prices, which are measurable quantities and can be treated as "objective." However, the criteria for attaching price tags to values explicitly, which essentially amount to political choices, are not made explicit.

The focus on prices not values perpetuates the tension between quantity and quality, between economics and ecology, which haunts all methods of ecological data analysis (Pfriem, p. 223). This is quite evident in the various techniques of environmental accounting that lie at the origin of ecological auditing, as defined below. In the accounting system developed by the Swiss economist Ruedi Müller-Wenk during the late 1970s, the various environmental impact factors—energy consumption, resource consumption, water contamination, etc.—are quantified and recorded. The different factors are then compared with each other with the help of "equivalence coefficients" based on ecological scarcities. Thus different companies, or environmental impacts of one company in different years, can be compared.

The key problem with this method is how to determine the equivalence coefficients which give the method a scientific-mathematical appearance but at the same time mask an underlying political decision (Pfriem, pp. 219ff.). Moreover, the focus on scarcity as the only criterion ignores other ecological impacts, such as species extinction, and tends to emphasize the ecological status quo rather than the need for restoration.

Methods of Environmental Auditing

The methodology of environmental auditing is well developed, and several textbooks summarize it thoroughly (see Appendix A).

Generally companies possess written permits for specified maximum discharge quantities, and auditors (who usually work in teams of several people and spend several days in a given plant) begin their work by assembling and verifying these permits. Since large companies keep records of discharges and other environmental effects of their operations, auditors check a sampling of these records against permitted levels. They also physically inspect plants and investigate recording and reporting procedures to determine if they are providing reliable information. In a few cases auditors may carry out independent laboratory tests, for example of emissions.

In inspecting plants, auditors are trained to observe closely many key facilities: fuel and chemical tanks and their surrounding catchments, stacks, discharge lines, recovery systems, storage facilities, alarm systems, transportation practices, and so on. Detailed protocols or checklists, adapted in advance to likely problems in a given plant, are employed to insure complete coverage of possible trouble-spots. Questionnaires and direct interviewing techniques are both used to gather information. Laboratory test procedures are checked. Operating manuals, records, reports to outside agencies, and other management documents are scrutinized, and attempts are made to determine whether they are followed by staff—which is often difficult. Sometimes flow charts of a plant's processes are prepared, facilitating an evaluation of whether management control is adequate. Since employee safety regulations and environmental regulations have some degree of overlap (e.g., regarding hazardous substances used in production processes) auditors also concern themselves with safety, including worker safety gear and emergency plans. Noise, dust, and odors, which may affect both employees and neighbors of the plant, are also scrutinized.

As the audit proceeds, tentative report materials are transmitted to management for comment and discussion. These form the basis for the final report delivered at the end of the audit. This report provides an evaluation of company compliance with relevant regulations and also notes problem areas requiring attention.

Methods of Ecological Auditing

We review below a number of methods of ecological data collection and analysis.[4] Some of these methods are used in general business practice in other contexts and have been around for a very long time; some date from the social auditing of the 1960s and 1970s; some have been adapted from environmental auditing; and some have been developed,

particularly in Germany and Switzerland, during the late 1970s and 1980s. As we will explain in the following chapter, ecological auditing is more comprehensive than compliance or environmental auditing, and its repertoire of methodologies is broader.

In Germany and Switzerland, auditing in many companies has gone well beyond government regulations to examine the "ecological compatibility" of a company's operations. The task is not only to verify compliance with fixed standards but also to minimize environmental impact. This includes protection of employees and the community, provision of an ecologically healthy workplace, and manufacture of "eco-friendly" goods. Such broader concerns are only beginning to appear in the thinking of American environmental auditors, even though they are often dealt with by corporations in other perspectives.

Successful use of eco-auditing procedures will depend on the extent to which they enable an auditor to overcome the tension between economics and ecology by integrating qualitative and quantitative approaches.

- Environmental Indicators
  Environmental indicators such as "biological oxygen demand" (BOD) identify specific pollutants defined by governmental regulations. While providing a quantitative standard, the indicator method tends to ignore synergistic effects and involves value judgments that are not made explicit.

- Environmental Accounting
  Types of inputs and outputs (e.g., raw materials use, effluents, waste heat) are selected and quantified to show that the "true cost" which includes environmental impacts clearly exceeds market price. Therefore, even expensive alternatives which are *less* ecologically damaging can be economically justified for the economy as a whole. Analysis, comparison, and evaluation of inputs and outputs are made possible through use of "equivalence co-efficients"—a method which, though flawed, introduces ecological ethics into traditional economic analysis.

- Environmental Impact Assessment
  Originally based on the U.S. National Environmental Policy Act (1969), impact assessment represents an institutional check for compliance with environmental regulations. Environmental Impact Studies and Environmental Impact Reports use both quantitative measures (such as increases of traffic and air pollution) and qualitative ones (such as impacts on habitats of rare or endangered species). Similar procedures have been adopted by other nations, including Germany.

- Economic Feasibility Calculations
  This approach exclusively uses economic criteria with methods derived from accounting (for example, amortization and capital depreciation). However, these do not calculate whether investments or production processes are ecologically important or successful and cannot dissipate the tension between economics and ecology.

- Technology Assessments
  Like the environmental impact assessment, this method was developed for decision-making processes within governmental agencies. This deals specifically with the predicted social and political consequences of new technologies, but can integrate ecological considerations as well.

- Material and Energy Auditing
  This method, often incorporated in practical applications, can be especially useful in analyzing environmentally harmful "microprocesses" in a business, but can also serve as a permanent material flow matrix. A special feature of these physical measurements is that they can be used as criteria for establishing acceptable pollutant limits for environmental protection.

- Market or Survey Research
  This means gathering information, through questionnaires and controlled experiments, about the demand for ecologically friendly products, how much consumers are willing to pay for them, and the degree of public environmental consciousness either generally or on specific issues.

- Cost-Benefit Analysis
  This method evaluates outcomes to investors and others (such as employees) directly affected by an activity. Although it attempts to provide precise calculations of all effects, problems remain in establishing a monetary equivalent for different perceived outcomes.

- Social Balance Sheet
  The traditional concept of the "balance sheet" describing an enterprise in terms of financial assets and liabilities is extended to include relevant ecological and social costs as well as benefits.

- Environmental Databanks
  Databanks are actually sources of information rather than instruments of analysis, but their inclusion here is justified by the increased impor-

tance of information retrieval within the audit planning procedure. So far several databanks are used in Germany to facilitate and improve ecological planning processes. Databanks provide information on environmental conditions, ecological standards, pollutant threshold values, and literature references. The following databanks are widely used:

UMPLIS (general information and document system)
AWIDAT (waste management information)
DABAWAS (water pollutant data)

- Checklists
  Checklists have evolved as a fundamental tool of both eco-auditing and narrower compliance auditing. Often checklists have been compiled on an *ad hoc* basis and lack logical rigor. The central task lies in compiling a systematic listing of the complex ecological relationships involved in production and consumption. These conceptual aids can then stimulate decision-making via categorizing and comparing factors. (See Chapter 6 for our summary of checklists.)

- Decision Tree Method
  Useful for decision-making methods where conflicting ecological aims exist, this method involves ordering goals into a hierarchy and then ranking subgoals with respect to their contribution toward achieving higher goals.

- System Dynamics
  Complex simulation of system processes is here made possible through computer analysis. This costly method was developed by J. Forrester to simulate economic and ecological growth processes, and has been applied to certain global models.

- Scenario Building
  This technique is useful for developing broad participation in a company's ecological planning. In the "Future Lab" version of the techniques developed in Germany by Robert Jungk and Rüdiger Lutz (Lutz, 1981), discussion groups are asked to develop alternative possible scenarios for the future:

  —the status quo scenario
  —a positive alternative scenario
  —a realistic counter scenario
  —a strategic scenario as a synthesis of the first three

While techniques such as cost-benefit analyses require expert preparation and focus on specialized problems, scenarios are opportunities to interrelate many factors in the company as they are perceived or envisioned by a broad sample of people. Thus they are useful for seeing the relationships between individual or departmental concerns and the future of the company as a whole. Since they set up alternative basic paradigms, they also tend to stimulate creative and innovative thinking.

It is to be hoped that a proactive, creative approach to broad and comprehensive auditing ("ecological auditing," as we shall define it in subsequent chapters of this report) will develop strongly throughout the world. In view of the strong encouragement of the U.S. Environmental Protection Agency, continuing concern with energy efficiency, growing demand for "eco-friendly" products, and the worldwide influence of European product eco-labelling standards to be expected after 1992, a shift of perception similar to the one that emerged in the German corporate community during the 1980s is likely to get underway very soon in the American corporate community.

Indeed, there are already entrepreneurs in the United States and Britain who have adopted an ecologically conscious management style in their companies and are now experimenting with creative approaches to ecological auditing. In the following section, we present profiles of some of these companies, both in Europe and the United States.

Case Studies[2]

Around the mid-1980s, numerous European companies began to adopt simple ecological practices like recycling programs, energy-saving measures, reusable containers, etc. Some of them went much further and began to move toward a more comprehensive ecologically oriented management. A German chemical company (SKW Trostberg), for example, not only redesigned its production processes to make them less ecologically damaging, but also instituted employee information and motivation programs, and gave financial support to environmental organizations and various environmental impact studies. A leading mail-order business (Otto Versand) audited its product offerings and eliminated particularly harmful products from its stocks, including items made of rainforest wood or involving the killing of endangered species.

A cosmetic company in Hamburg (Elida Gibbs) strives for exemplary openness in its "Green Reports," maintains contacts with leading environmental activists, and created a company-wide "eco-team" consisting of representatives of all departments. A manufacturer of industrial supplies (Friedrich Niemann) publishes a "Green Catalogue" of eco-technologies.

A Swiss supermarket (Coop Schweiz) developed its own eco-labelling system. A beer brewery (Neumarkter Lammsbräu) pioneered a "holistic management philosophy" that includes organic agriculture, ecologically sound brewing and packaging processes, and utilization of solar energy.

Most of these exemplary companies conduct partial ecological audits, and a few even developed comprehensive auditing systems. One of those is Winter & Sons, an industrial company in Hamburg producing diamond cutting tools, which developed the Winter model discussed above. Another trendsetter has been Bischof & Klein, one of Europe's largest packaging companies, which designed a comprehensive "eco-blueprint" as a guideline for its corporate policies (see Steger, p. 263). Moreover, it was the first industrial enterprise in Germany to initiate a systematic ecological audit, which involves three levels: a company audit, product audits, and process audits. This system has been so successful that Bischof & Klein now plan to offer it to other companies.

In England, The Body Shop, a cosmetic company founded by Anita and Gordon Roddick, is engaged in ecological practices of similar depth and pioneering quality.[3] The company's culture and activities are based on the vision of its founders of a successful business activity promoting environmental and social issues and working these into its day-to-day practices. Since the opening of its first outlet in 1976, The Body Shop has grown into an international network of over 450 shops in 37 countries, founded on a number of common ecological principles:

- to sell cosmetics with minimal hype and packaging;
- to promote health rather than glamor;
- to use natural ingredients wherever possible;
- not to test ingredients or final products on animals;
- to provide a refill service in all shops;
- to recycle waste and use recycled paper wherever possible.

The company buys raw materials from all over the world and has a policy of sustainable, non-exploitative trade agreements with communities in economically disadvantaged countries.

A key characteristic of The Body Shop is to use its show windows, carrier bags, etc., for radical, highly unconventional campaigns about a wide range of environmental and human-rights issues.

From its beginning, The Body Shop has had a clear top-level commitment to ensuring environmental and social excellence. Environmental concerns are incorporated into every

aspect of its operations. Due to the recent expansion of the business, the need for a formal approach to ecologically conscious management was recognized, and it was decided to have an all-embracing environmental audit with the goal of producing a formal environmental policy statement.

Many of the techniques recommended in our report are practiced by The Body Shop. They include effective multi-media communication, both internally and externally; supportive relationships with grassroots organizations; staff training programs with strong environmental emphasis; ecological purchasing standards and product development; and an extensive waste management program.

So far, The Body Shop's environmental audit has covered only the offices and warehouses at the company's headquarters. An expansion to include the shops and subsidiary companies was not undertaken at this first stage, because it was felt that the methodology of such all-embracing audits is still poorly developed. However, further steps are planned for the future.

In the United States, Smith & Hawken, a California mail order company selling gardening supplies, housewares, and clothing, is one of the very few businesses to conduct a wide-ranging eco-audit along the lines suggested in our report.

Concern for the environment has always been an important part of the company's philosophy, but in December 1989 they began a more formal (even though not initially systematic) environmental audit which, several months later, produced an environmental policy statement for 1990 that was made available to all customers ("Environmental Action at Smith & Hawken in 1990," April 1990, updated July 1990).

The actions initiated by the audit include widespread recycling and reuse of materials, a company-wide ban on styrofoam, elimination of toxics and of plastic wherever possible, numerous energy and water saving measures, and support of bicycling as a means of transportation to and from work.

In addition, Smith & Hawken have conducted in-depth studies on the history and forest management of teak to make sure that their teak furniture (from Javanese tree farms) is environmentally sound. They also donated money to rainforest groups and offered their business as a testing ground for developing teak certification programs.

One of the most remarkable actions of Smith & Hawken has been to question the ecological sustainability of the industry to which the company belongs, the mail-order business, as part of their eco-audit (as we suggest in Chapter 4 of this report). In a four-page statement, "The Junk Stops Here," cofounder Paul Hawken reviewed the excessive and wasteful practices of the catalog and direct-mail industry (including many environmental organi-

zations!), and set forth a number of guidelines adopted by the company to counteract the disastrous environmental impact of this trend. These include

- catalogs printed on recycled and recyclable paper;
- a "sanctuary forest program" in which two or three trees are planted on degraded habitat for each tree used by the company;
- use of soy-based inks instead of metallic inks;
- publication of the catalog in separate subsections tailored to customers' needs in order to avoid sending unwanted coverage to each customer;
- a more responsible policy regarding the rental of mailing lists;
- no changes in the catalog for extended periods to avoid seasonal "remailing";
- a special service to help customers reduce their junk mail.

Smith & Hawken are a signatory to the Valdez Principles, have founded an internal "Valdez Committee," and have undertaken to conduct an annual audit to be reviewed by CERES.

In our next chapter we discuss some of the changes in thinking that underlie the new practices that companies such as the above have pioneered.

– 3 –

ECOLOGICAL AUDITING

Distinction between Environmental and Ecological Auditing: The Paradigm Shift

To establish the conceptual framework for the theory and practice of eco-auditing, to be discussed in Part II of this report, we shall now distinguish between "environmental auditing" and "ecological auditing" (or "eco-auditing"). We use the former term to refer to the defensive, reactive approach exemplified by compliance auditing, the latter to indicate the proactive, creative approach developed in Germany and refined conceptually by the Elmwood Institute. The purpose of ecological auditing is to minimize a company's environmental impact and make all its operations as ecologically sound as possible.

Our starting point is the recognition that the world's ecological problems, like all the other major problems of our time, cannot be understood in isolation. They are systemic problems—interconnected and interdependent—and need a new kind of systemic, or ecological, thinking to be understood and solved (Global File Report #1, p. 3). Moreover, this new thinking must be accompanied by a shift of values from expansion to conservation, from quantity to quality, from domination to partnership. The new value system and thinking, together with corresponding new perceptions and practices, are what we call the "new paradigm" (see "Critical Questions About New Paradigm Thinking," *Re-Vision*).[6]

The philosophy underlying the practice of eco-auditing, as understood by Elmwood, is based on the conviction that the environmental impact of a company's operations will not improve significantly unless the company goes through a radical change in its corporate culture—a paradigm shift as described above.

The new paradigm may be called a holistic world view—seeing the world as an integrated whole rather than a dissociated collection of parts. It may be called a systemic view, or systems view, referring to its more abstract theoretical underpinning by systems theory. Finally, the new paradigm may be called an ecological view, using that term in a much broader and deeper sense than usual.

Shallow Environmentalism and Deep Ecology

Our distinction between environmental auditing and ecological auditing implies the use of "ecological" in that broader and deeper sense. We see our terminology as a specific application of the distinction between "shallow environmentalism" and "deep ecology," terms coined in the 1970s by the Norwegian philosopher Arne Naess (Devall and Sessions). This distinction is now widely accepted as a very useful terminology for understanding a major division within contemporary environmental thought.

In his review paper, "Deep Ecology: A New Philosophy of Our Time?" Warwick Fox discusses the following three characteristics of Arne Naess's distinction, each of which is clearly pertinent to our distinction between (shallow) environmental and (deep) ecological auditing.

- *Shallow environmentalism accepts the dominant mechanistic paradigm.*
  Deep ecology involves the shift to a holistic, systemic world view.

Environmental auditing does not question the dominant corporate paradigm. It sees the company as a machine that can be controlled and adopts the framework of conventional economics. In compliance auditing, methods based purely on quantification can be applied, since government regulations and standards are quantified. However, this necessarily reinforces the status quo and offers no guidance for solving urgent environmental problems not reflected in governmental actions.

Ecological auditing involves the shift from mechanistic to systemic thinking. An essential aspect of this shift is a change of perception from the world as machine to the world as a living system. This change concerns our perception of nature, of the human organism, of society, and thus also our perception of a business organization. Companies are living systems that cannot be workably comprehended from the economic point of view alone. As a living system, the company cannot be rigidly controlled through direct intervention but can be influenced by conveying orientations and giving impulses. Such a new style of management is known as systemic management (Capra, Exner, Königswieser; Elmwood Institute working paper).

- *Shallow environmentalism is anthropocentric: it views humans as the source of all value and ascribes only use value to nature. Deep ecology recognizes the intrinsic values of all living beings and views humans as just one particular strand in the web of life.*

Environmental auditing is associated with the idea of coping with environmental problems for the benefit of the company. It lacks an ethical dimension and its main motivations are legal compliance and improvement of the corporate image. Ecological auditing, by contrast, is motivated by an ecological ethic and by a concern for the well-being of future generations. Its starting point is a change of values within the corporate culture.

- *Shallow environmentalism tends to either accept by default or positively endorse the ideology of economic growth. Deep ecology replaces the ideology of economic growth with the idea of ecological sustainability.*

Environmental auditing does not question the ideology of economic growth, which is the main driving force of current economic policies and, tragically, of global environmental destruction. Rejecting this ideology does not mean rejecting all growth, but rather rejecting the blind pursuit of *unrestricted* economic growth, understood in purely quantitative terms as maximization of profits or the GNP. Ecological auditing includes the recognition that unlimited economic growth on a finite planet can only lead to disaster. Accordingly, the concept of growth is qualified by introducing ecological sustainability as a key criterion for all business activities.

Elmwood's Definition of an Eco-Audit

Based on the preceding discussion of the differences between (shallow) environmental and (deep) ecological auditing, we shall adopt the following definition of an eco-audit:

An eco-audit, as understood by the Elmwood Institute, is an examination and review of a company's operations from the perspective of deep ecology, or the new paradigm. It is motivated by a shift of values in the corporate culture from domination to partnership, from the ideology of economic growth to that of ecological sustainability. It involves a corresponding shift from mechanistic to systemic thinking and, accordingly, a new style of management known as systemic management. The result of the eco-audit is an action plan for minimizing the company's environmental impact and making all its operations more ecologically sound.

The term "audit," derived of course from financial audits, tends to connote a precise and narrowly defined examination according to government regulations, company policies, or "generally accepted practices." Eco-auditing in the broad sense being advocated by Elmwood includes procedures that are sometimes called "surveys," "assessments," "appraisals," "reviews," and so on. The common element in these terms is an indication that a systematic examination of a company's operations, from an ecological standpoint, is being carried out. It is important to note that since the employees who actually do the work are the most familiar with it, they must be a part of the audit procedures. They are likely to come up with many innovative ideas, given suitable genuine encouragement and reward; thus, one "methodology" for ecological improvement in a company is to mobilize the concern and ingenuity of all employees.

PART II

Theory and Practice of Ecological Auditing

– 4 –

Redefinition of Corporate Culture

New Perceptions, Ideas, and Values

Our starting point is the conviction that eco-auditing involves basic changes in the corporate culture. The eco-audit, as understood by Elmwood, is motivated by the values and is based upon the concept of deep ecology. Its success will depend on the extent to which the ecological paradigm is reflected in the corporate culture.[7]

The concepts of "paradigm" and "corporate culture" are closely related. A social paradigm may be defined (see *ReVision*, Summer/Fall 1986) as a constellation of concepts, values, perceptions, and practices, shared by a community, which forms a particular vision of reality that then becomes the basis for the way a community organizes itself. Corporate culture may be defined as a cohesion of ideas, values, norms, and modes of conduct, which has been accepted and adopted by a company through a process of consensus, and which constitutes the distinctive, unmistakable character of the organization. Or, as the managing director of a major consulting company put it more informally, corporate culture is "the way we do things around here" (Deal and Kennedy, p. 4).

The basic question, then, is: What does it mean to expand and redefine the corporate culture in such a way that it reflects the paradigm of deep ecology? It would go far beyond the scope of this report to discuss the paradigm shift in science and society in all its ramifications. In the following paragraphs we shall merely outline the key elements of the change of paradigms with special emphasis on those most relevant to the corresponding redefinition of corporate culture.

In order to carry out a successful eco-audit, a company's corporate culture should include the following perceptions, ideas, and values.

State of the World

The nineties are a critical decade. The survival of humanity and of the planet are at stake. We are faced with a series of global problems which are harming the biosphere and human life in alarming ways that may soon become irreversible (see Worldwatch Institute's annual *State of the World* reports). The Earth's forests are being cut down, while its deserts are expanding. Topsoil on our croplands is diminishing, and the ozone layer, which protects us from harmful ultraviolet radiation, is being depleted. Concentrations of heat-trapping gases in the atmosphere are rising, while numbers of wild plant and animal species are shrinking. World population continues to grow, and the gap between the rich and poor continues to widen.

Interconnectedness of Problems

None of these problems can be understood in isolation. They are systemic problems—interconnected and interdependent—and need a systemic approach to be understood and solved.

Shift from Objects to Relationships

The systemic nature of the world's problems derives from the fact that the world itself, our planet Earth, is an integrated whole, a living system. The shift of perception from the world as a machine to the world as a living system is a key characteristic of the ecological paradigm. Reality is no longer seen as a collection of separate objects but rather as an inseparable web of relationships.

Shift from the Parts to the Whole

Living systems comprise individual organisms, social systems, and ecosystems, all of which are integrated wholes embedded in larger wholes on which they depend. Systemic properties are destroyed when a system is dissected, either physically or theoretically, into isolated elements. Although we can discern individual parts in any system, the nature of the whole is always different from the mere sum of the parts. The nature of any living system, including a business organization, derives from the relationships among its components and from the relationships of the whole system to its environment.

Shift from Domination to Partnership

The shift of values from domination to partnership is another key element of the ecological paradigm (Eisler). Whereas a machine is properly understood through domination and control, the understanding of a living system will be much more successful if approached through cooperation and partnership. In nature, all competition is intricately connected with cooperation. Cooperative, symbiotic relationships are an essential characteristic of the web of life.

Shift from Structures to Processes

Systems thinking is process thinking. Every structure is a manifestation of underlying processes. The web of relationships is intrinsically dynamic. Fluctuations play a crucial role. The system's stability is achieved through a dynamic balance, characterized by continual interdependent fluctuations of all variables. The more dynamic the state of balance, the more flexible the living system; the more flexible the system, the greater its stability. Stress is lack of flexibility.

Shift from Self-Assertion to Integration

A healthy dynamic balance in living systems includes the balance between self-assertion and integration, two essential tendencies of all life. As integral wholes, living systems need to assert themselves in their individuality; as part of larger wholes they need to integrate themselves into the larger patterns. In our culture we have overemphasized self-assertion—competition, expansion, quantity—and neglected integration—cooperation, conservation, quality. The paradigm shift includes the shift of values from self-assertion toward integration.

Shift from Growth to Sustainability

As far as business organizations are concerned, the most important example of the shift from expansion to conservation, from quantity to quality, is the shift in fundamental criteria of "success" from economic growth to ecological sustainability. As mentioned before, the blind pursuit of unrestricted growth is the main driving force of global environmental destruction. Growth, of course, is characteristic of all life. However, in the living world, it has not only a quantitative meaning. Ecologically conscious management includes qualifying economic growth by also introducing sustainability as a key criterion for all business activities. What is sustained in a living system over time is its pattern of organization, i.e., the web of relationships that defines the system as an integrated whole. That pattern, the very essence of the system, is a qualitative feature.

Systemic Management

Corporate culture is the result of a long process of consensus, and any changes in it will require the involvement of people at all levels of the company's organizational structure.

Ecological consensus cannot be imposed from the top but must be developed creatively with the inner commitment of the entire workforce. This is why the practice of "systemic management" must be an integral part of eco-auditing. This new style of leadership, informed by systemic thinking and acting, has been developed in Europe over the last

decade and is now also gaining acceptance in the United States. We shall limit ourselves here to a few key points.

Systemically oriented managers do not see themselves as the dominators and controllers within the company, but rather as "cultivators" or "catalysts." Being aware of the nature of the company as a living system, they give "impulses" rather than instructions.

Systemic managers have to learn how to live with uncertainty. They act within a social system which they cannot comprehend completely and whose reactions and events they will never predict with certainty, let alone control. However, this does not relieve them from the responsibility for providing guidance to the organization.

The view of the stability and flexibility of a social system as a consequence of its dynamic balance suggests a corresponding strategy of conflict resolution. In every company, as in society as a whole, conflicts and contradictions will invariably appear which cannot be simply resolved in favor of one or the other side. Thus we need stability and change, order and freedom, tradition and innovation, planning and laissez-faire.

A systemically oriented manager knows that the contradictions within a company are signs of its variety and vitality, and thus contribute to the system's viability. Without conflicts there can be no development. A systemic manager will therefore try to take into account both sides of a contradiction, knowing that both will be important depending on the context. He or she will try to solve inevitable conflicts not by means of rigid decisions but rather through dynamically balancing both sides.

Corporate Goals and Strategies

Critical Analysis of Corporate Philosophy

The first step in redefining the company's corporate culture will be a critical analysis of its corporate philosophy: To what extent are the perceptions, ideas, and values outlined in the beginning of this chapter reflected in our corporate culture? Such a critical analysis might begin with very general and deep questions. The top managers will need to ask themselves in all honesty:

- Am I really concerned about the state of the world, or will I merely act to give myself a better image or boost my ego?

- Do I really understand the key ideas of ecology, or do I merely repeat a few "buzz words"?
- Do I myself live in an ecologically conscious way, or is there a discrepancy between my words and my acts? Do I "walk my talk"?
- To what extent are the principles of systemic management part of our corporate culture?

The next step might be to examine the ecological sustainability of the industry of which the company is a part:

- Are the products and services of the industry ecologically sound, or are they unnecessarily destructive?
- What changes would make the industry less ecologically damaging?

Then the sustainability of the company might be examined:

- What is our philosophy regarding economic growth?
- How would we qualify the concept of growth?
- Can we remain motivated to change without the goal of quantitative growth?

A thorough examination of these basic philosophical questions may lead to an expansion, or reformulation, of the company's mission statement to reflect deep ecological values.

Key Issue Analysis

The preceding philosophical analysis should allow reformulation of corporate goals and strategies in such a way that they include the ecological dimension as an integral part. To begin, it will be useful to focus on key ecological issues in the company's areas of activity.

What are the *opportunities* and *risks* in our operating environment and in the market?

- legislation
- public awareness
- customers' awareness

- competitors' activities
- scientific and technological developments

What are our *strengths* or *weaknesses*?

- availability of finances for ecologically oriented investments
- ecological awareness of top management
- flexibility of management and staff
- relevance of the company's products and services to environmental protection
- support of community for ecological improvements

Formulating Ecologically Oriented Corporate Goals

Once the key ecological issues have been identified and analyzed, ecologically oriented corporate goals may be formulated. It may be helpful to begin this process by formulating a set of ecological guiding principles, e.g.,

- demonstrate compatibility of market economy with ecological requirements;
- safeguard the company's survival by recognizing global trends at an early stage and planning accordingly;
- seek competitive advantages by minimizing environmental impacts;
- adopt a proactive, creative approach to ecological challenges in all areas of the company's activity;
- cooperate with business and academic partners to speed up the accumulation of ecological knowledge.

The *long-term ecological goals* for the company as a whole may be formulated, e.g.,

- capitalize on the goodwill of staff, the general public, and government agencies resulting from the company's ecological commitment;

- take advantage of cost cutting through energy and resource conservation and progress in other eco-friendly technologies;
- minimize risks arising from management or product liabilities, sudden changes in legal norms, or sudden increases in ecologically motivated consumer demands;
- influence legislation through ecologically oriented lobbying.

Similar goals need to be formulated for all *departments*, e.g.,

- personnel: increase the company's attractiveness to environmentally concerned employees, thus reinforcing staff loyalty;
- procurement: manifest ecological awareness in purchase of raw materials and supplies;
- production: cut costs by saving energy, raw materials, and water;
- product design: revise specifications to lessen impacts in production, use, and disposal;
- distribution: seek to use means of transportation that use less energy and cause less pollution.

Finally, the relationships between the company's ecological and economic goals need to be assessed:

- analyze implications of ecological goals for turnover, costs, and profits;
- identify major areas of conflict;
- lay down long-term priorities within the system of corporate goals, possibly with ecological priorities changing over time.

Motivating Change

Change toward ecologically responsible operations depends on the participation of everyone in a company. Any members of the management team who are not convinced of the need for ecologically conscious management and of the advantages to be gained from the eco-audit must first be motivated. And as long as the employees are not convinced, the project will fail no matter how well it has been prepared in other respects.

Formulating and implementing the corporate goals and strategies discussed in the preceding chapter will be much easier if the management style is cooperative and systemic. The focus should be on liberating people's energies, recognizing their latent potentials, giving orientations, setting processes in motion, showing respect and consideration, emphasizing intuition, meaning and vision, increasing flexibility, and enhancing the system's learning potential. Once these patterns are established, the eco-auditing project may virtually run itself.

Convincing department heads of the advantage of an eco-audit will be much more effective if you emphasize their own concerns and take examples from their own departments. For example, you would emphasize human relations with the head of personnel; publicity, image, and advertising with the head of sales; reducing waste disposal problems with the head of materials management; cost savings with the head of finance; etc.

It will also help to appeal to whatever motivates the department heads personally, empathizing with their feelings and thought processes. Where there is a perceptible desire to enhance the corporate spirit, you would mention the integrating effect of ecological consciousness; where there is an evident need for public esteem, you would stress removing the blemish of environmental damage caused by certain company activities; where there is a pressing need for self-realization, you would focus on the opportunity to do genuine pioneer work in the area where economics and ecology meet.

When it comes to making decisions, individuals should be well prepared by providing information and motivating people in advance. If the decision is likely to be controversial, you might wait for an opportune moment, e.g., the announcement of a successful year's sales, a special anniversary, a major order, etc.

When the decision has been made, it will be wise to give special attention to the members of the management team who have been outvoted, rather than treating them as defeated opponents.

Decisions on ecological measures should be given wide in-house publicity to ensure that the management team is seen to be acting in unison and to bind its individual members more strongly to the collective decision. When the decision generates positive responses and results, all those involved in it should be acknowledged, both in the company and in the media, so that everyone may share in the success. When there is a negative response (e.g., carping about the quality of recycled paper), stand by the members of the recycling team who are under fire to strengthen the team spirit. Every opportunity should be taken to thank and praise members of the team for their ecological awareness, thus motivating others for future actions.

The strongest motivating force for the company's people will be their sense of personal integrity and significant involvement in the firm. As ecological awareness rises among the general public, they will feel increasingly that they can no longer fully identify with jobs that are environmentally destructive. The more they realize that their work will contribute to protecting the environment, the more enthusiastic they will become for carrying out the company's eco-audit and implementing its results.

It is also important to foster the awareness that high ecological standards go hand in hand with high standards of work in the traditional sense. By realizing that the shift from quantity to quality is a key characteristic of deep ecology, the new ecological consciousness may be integrated with traditional concerns for high-quality work.

Similar considerations apply to the quality of human relationships within the company, the physical working environment, food, etc. The more humane, healthy and ecologically sound these are, the easier it will be to raise ecological consciousness.

As with managers, it will help to appeal to the individual employees' personal concerns and motivations. For example, the need for safety may be addressed by improved safety information and monitoring; the need for a sense of belonging by leading and participating in educational group activities; the need for material rewards by bonuses and other incentives; the need for status by awards and other signs of recognition; the need for self-realization by increased participation in ecological planning and strategizing.

Since the ecological paradigm involves a holistic view of the world and of human nature, it will also be useful to address the whole person in motivation and training programs. This may involve addressing feelings through an experiential approach to ecology; through training in systems thinking; the sense of responsibility by emphasizing responsibility for one's health, one's fellow human beings, other living creatures, and future generations; judgement by developing the ability to assess and select ecological options; and action through constant encouragement to put new insights and decisions into practice.

In all these areas psychological preparation, moral support, and the rewarding of success will be crucial. No one should be presented with a *fait accompli* but should be consulted well in advance of any decision, so that their expertise is acknowledged and utilized. Thanks and praise for successful ecological measures need to be given generously.

Having made these general comments, we shall now list some suggestions for developing a coherent employee motivation and training scheme. Four basic questions need to clarified:

Who is to be motivated and trained?
Who is to be responsible for motivation and training?

What is to be conveyed?
Which methods are likely to be successful?

People to be motivated and trained may include trainees; employees' families, household members and domestic partners; and employees of service companies who work regularly or frequently in the company.

People responsible for motivation and training may include, in addition to in-house executives and environmental officers, representatives of environmental agencies; scientists, engineers, and inventors; representatives of environmental organizations and consumer associations; representatives of companies producing environmental technologies; craftspeople who practice their crafts in ecologically sound ways and are able to give practical demonstrations; public figures and celebrities who can speak about ecological principles or their own ecological commitment and thus set an example.

The perceptions, ideas, and values to be conveyed have been previously outlined. The basic insights are not difficult to understand, and they convey an exciting new way of seeing the world. The more all employees comprehend and embrace them, the stronger will be the collective motivation for ecologically sound business operations.

Over the past decade, a great variety of *motivation and training methods* have been used successfully, both in Europe and the United States. The examples listed below should allow each company to select methods most appropriate to its own corporate culture.

(1) Dissemination of Information

Notice boards, the company newspaper, circulated material, an ecology library, regular reports, and speeches for special occasions are all effective channels to disseminate ecological information.

- *Bulletin boards* may display press articles dealing with the environment, information on forthcoming radio and television programs, and information on in-house ecological measures. A special "ecology notice board" would emphasize the extension of the company's goals into this new domain.
- The *company newsletter* could feature a regular environment column, a special issue on the environment, and special issues on ecological lifestyles (recycling, organic gardening, bicycling, etc.).

- *Circulated material* on environmental issues may include material published by the Worldwatch Institute, Greenpeace, and other environmental organizations.
- A special *ecology library* could include books, magazines, newsletters, charts, posters, slides, audio and video cassettes.
- *Regular reports* and the traditional *speeches for special occasions* offer ideal opportunities to report on successes and shortcomings in the company's ecological management and to demonstrate that it is an integral part of corporate policy.

(2) Social Events

In addition to speeches at the traditional social functions, special events may be created to promote ecological awareness. These might include:

- An environmental raffle at office parties with a bicycle as the main prize and ecologically oriented books, videotapes, etc., as additional prizes;
- Bicycle excursions or nature walks for employees;
- Visits to ecological show-places: demonstration houses, efficient companies, alternative energy installations, etc.;
- Open house days for employees and their families, domestic partners, and friends to demonstrate the company's ecological practices;
- A party for employees and their families and friends to extend ecological awareness.

Open house days, children's parties, and other events will be especially effective if residents in the neighborhood are invited as well. Particularly in small communities, this will have a very beneficial effect on the company's public image and may attract reporters from the local media.

(3) Staff Involvement

All people in the company should be inspired and empowered to look for cost-cutting ecological measures, and successes should be rewarded. Before the beginning of each fiscal year, designated staff members in their departments should prepare a list of realistic

ecological objectives for the year. These objectives should be discussed carefully before they are finalized to see whether they are consistent with the company's philosophy and with the departmental objectives. The checklists in Chapter 6 of this report will be helpful for drawing up the list of objectives.

Special care should be taken to ensure that ecological and economic objectives are worked out with the same degree of thoroughness and that employees are equally determined to attain them. Periodic interviews and progress reports might be considered, and the importance of replacing hierarchical monitoring by self-monitoring should be emphasized to increase staff involvement and job satisfaction.

Members of quality circles—in which employees make suggestions for improvements in a creative atmosphere without regard to hierarchical levels—should be encouraged to address themselves to ecological issues. Ecological consciousness is an integral part of quality consciousness.

(4) Incentives

In all incentive schemes great care must be taken to ensure that the criteria on which rewards are based are clearly defined and equitably applied. Special incentives for ecological measures might include:

- A bonus for attaining or exceeding ecological objectives, designed in such a way that under-target ecological performances cannot be offset by over-target economic performances and vice versa;
- A bonus scheme whereby the bonus for attaining economic objectives is reduced unless the ecological objectives are attained as well;
- A company suggestion scheme for ecological measures which gives employees a share of the savings made as a result of their suggestions;
- Non-monetary rewards for ecological suggestions that will not save money;
- Integration of ecological performance and economic performance in the company's promotion criteria.

(5) Recognition

Praise, thanks, and recognition for demonstrating ecological awareness are most appropriately expressed at public occasions and traditional social functions. Employees who have distinguished themselves may be given special awards at those occasions. Care should be taken that exceptional performances in the ecological domain and in traditional fields are rewarded in the same way. Job descriptions and promotion criteria should be rewritten to credit effective participation on eco-teams and other ecologically oriented projects.

Employees who have distinguished themselves by originating or implementing ecological measures might also be suggested for awards by outside organizations. Moreover, effective public relations work should ensure that reports on the company's ecological activities appear in the media to give staff a feeling of recognition and strengthen the team spirit.

(6) Support of Outside Environmental Projects

To create staff support for environmental projects outside the company an environmental fund, supplied by small voluntary contributions by staff members (matched or exceeded by company funds) may be set up. The fund should be managed jointly by staff and management.

Consider allowing environmental organizations to use specialized corporate facilities (such as specialized information networks) and to draw on employees' skills. This might include paid staff time for assisting in ecological projects.

(7) Extension of Training

All training programs of the company will need to be extended to include the ecological dimension. This is especially important in the training of new employees, since they tend to be particularly receptive to ecological ideas and, being the new generation, will shape society in the future. A careful balance between economic and ecological effects should be established and maintained in all aspects of the training program. In particular, the misconception that the ecological component is a "soft option" should be eradicated. It should be made clear from the start of the program that the complexity of ecological interconnectedness poses difficulties but, at the same time, resolving ecological problems is especially rewarding.

Where a company maintains a major internal training program or participates in community

adult training and continued education programs, it should foster a balance between conventional and ecological teaching:

- Ecological training must not degenerate into a separate course with no obvious links to occupational training; it needs to be an essential aspect of normal training courses.
- The ecological components of regular courses must not be combined into isolated "learning units." Employees need to be made aware of the ecological consequences of every work step and receive practical training so as to optimize the ecological aspects of each step.
- The ecological components must be integrated in two dimensions: horizontally, by ensuring that all operational aspects are considered from the ecological perspective; and vertically, by ensuring that each work step or process in a particular sector is assessed from the ecological point of view.
- Special care should be taken to train the training supervisors, and especially the master craftspeople, who often combine honesty with pride in their craft and a strong sense of responsibility.
- Full use should be made of the services offered by existing institutions—representatives of environmental organizations, environmental courses at university extensions and other institutions of adult education, correspondence courses, etc.

The Organization of Ecological Management

Many large companies have established environmental management departments, generally reporting to the first level below the Chief Executive Officer (CEO) and responsible for carrying out policies adopted by top management. This gives them the organizational position they need to gain the serious attention of line managers. However, some organizational analysts believe that large line departments should also have their own environmental expertise and that change can sometimes be introduced more effectively through that arrangement. Some companies utilize "technical committees" whose members are drawn from all departments, to ensure that ecological concerns are addressed everywhere in the company; such committees should be set up on an ongoing basis, hold regular meetings, and prepare periodic reports. It appears that different "corporate cultures" determine which arrangement will be best for different companies. The objective remains the same: to diffuse ecological attitudes throughout the company in a coordinated manner.

The role and duties of ecological managers should be clearly defined and well publicized within the company. A good deal of such managers' work will be done in collaboration with representatives from many company departments on various levels; sometimes company-wide advisory committees are formed to assist the ecological manager. Some basic components of the positions include:

- manage programs to minimize waste emissions and comply with regulations;
- manage programs to minimize use of energy and water;
- assist in and help coordinate conversion to more ecologically acceptable products;
- prepare balance sheets which estimate as quantitatively as possible the benefits and costs of ecological programs within the company;
- monitor developments in ecological thinking and government environmental policies, giving early warning of implications for the company;
- monitor new products available for company procurement that are less ecologically damaging than ones presently used;
- handle liaison with unions regarding ecological matters;
- participate in ecological committees in the community and make recommendations for company positions and actions with regard to public issues;
- carry out information and training programs within the company, including meetings to educate employees and obtain feedback, tours of facilities, etc.;
- represent the company and its ecological policies to the community, bioregion, and outside world generally.

It is of course critical that ecological managers be given the funds and other resources necessary to carry out these tasks. A second requirement is that where disagreements arise between the ecological manager and line departments, they should be decided without delay. (Top management must recognize that such conflicts are usually a positive sign, indicating that the ecological manager is doing her/his job of raising neglected issues and attempting to bring about change.)

Budgeting for ecological management requires top management to make difficult judgments about long-range benefits to the company, both internally and externally, and to the world at large. Investment for ecological purposes should be planned separately and regular assessment of its effects should be carried out. A budget for ecological activities

outside the company (membership in associations, grants to organizations, support for university or other research programs, publications, etc.) should be set up separately from general public relations funding.

When an ecological management department is first being set up, and auditing activities are being planned, it is important to include coverage of all departments, all subsidiaries, and all subcontractors or suppliers, since only in this way can accurate information about the impact of the company's activities be obtainable.

It is helpful to conclude audits with very specific goals and time-tables for ecological improvement within the company—e.g., to eliminate risks from storage or handling of hazardous substances within a few weeks, to reduce water consumption by 20% within six months, or to switch from certain problematic materials to less damaging ones within twelve months. Such goals must be communicated clearly and forcefully to all involved in achieving them, and completion of the goals should be appropriately recognized.

Some companies, in Scandinavia especially, have created the position of "ombudsman" or "ombudsperson"—charged with advising and representing employees, outside normal management and union channels. The existence of such a function, which in ecological matters would usually involve "whistleblowing" employees, can contribute to the company's stability and its public image by reassuring employees, the surrounding community, and regulatory agencies.

Expression: Advertising Policy, Product Design Criteria, Public Image

The social/psychological context in which business now operates has been markedly changed by widespread public familiarity with ecological ideas. This has occurred in Western Europe, North America, and Japan. Eco-catastrophes, such as the Valdez oil spill, reported with images that are diffused worldwide through modern media of communication, arouse short-term peaks of distaste for corporations and corporate executives. Clear-cuts of timber, air and water pollution, and landfill leakage problems have led to heavily negative public perceptions of industry as irresponsible or uncaring about the environment, and thus indirectly about people and their children.

This situation poses new problems for corporations' ways of presenting themselves to the world. Techniques of media "damage control" have not proved markedly effective; 25% of

American consumers claim to have changed their buying choices because of negative impressions of particular companies. Thus many companies have been seeking positive ways of portraying themselves. Various industries have developed public-relations organizations seeking to justify practices that have come under criticism. A good many corporations have sought to develop a more positive image by providing grants to environmental groups, though this practice can backfire if the groups begin to be seen as captive or dependent. Others have devoted research or community-relations resources to the solution of particular ecological problems.

These efforts, if honestly carried out, probably help to reduce open public criticism and political pressure for regulatory action; it is as yet unknown whether they will affect deeper public attitudes. However, since they are "cosmetic" and do not substantially affect the actual impact of corporate operations on the environment, they do not constitute a realistic or sufficient long-term adjustment to changing social conditions. For that, changes in the technical operating factors dealt with in eco-audits will be essential, including changes in the process of product design.

Since not long after World War II, product design in American companies has been largely sales-department-driven, and decorative or style aspects of goods have been emphasized, both in design and in advertising. Considerations such as engineering finesse, reliability, durability, repairability, have been given more emphasis by foreign producers, especially the Japanese, and the favorable consumer response is manifested in the dimensions of the U.S. trade deficit. But ecological criteria for product design have only recently begun to be paid much attention, and this mainly in Western Europe.

Large numbers of American consumers are already seeking assurance that the products they buy are the least ecologically damaging possible: recycled papers, low-energy-consumption appliances, etc. These demands have not yet been significantly absorbed by the design profession. However, it is likely that in the next few years corporations whose products stress features of ecological "safety," low impact, and a long lifetime of reliable use will be strongly favored by a large proportion of consumers, simply through the spread of "conserving" lifestyles and ideas.

Moreover, this process will be accentuated as eco-labelling of products spreads from Western Europe (especially after its economic unification in 1992) through the other advanced countries. Eco-labels will increasingly guide consumers toward the purchase of less damaging products by specific symbols printed on the goods. Such labels state that a product (compared to other similar products) is, for example, made from recycled materials, consumes less energy or water, produces less air or water pollution, is less noisy, does not pose a contamination problem in use or disposal, is free of toxics such as chlorine, lead, etc. (For details, see Global File Report #3, "Product Eco-Labelling," by Ernest Callenbach.)

It is likely, therefore, that advertising policies will also have to adapt to changing conditions. "Image" advertising will have to become increasingly specific and concrete, to overcome chronic public skepticism fed by active media reporting in the environmental field. Product advertising should stress (1) lasting buyer satisfactions rather than transient ones; (2) attractive lifetime costs of products, rather than just initial costs (while ignoring operating or disposal costs); (3) competitive reliability, durability, and trouble-free qualities rather than initial emotional attractiveness; (4) possibilities of re-use of products or their containers, and/or recycling; and (5) the low-ecological-impact features of the manufacture, distribution, use, and disposal of products. "Eco-advertising," thus, will have to deal with the full production-use-disposal life cycle of a product, rather than focusing primarily on the thrill of the moment of purchase.

– 5 –

THE COMPANY AS A LIVING SYSTEM

In the remainder of this report, we shall present a detailed and coherent framework for the practice of eco-auditing. An ecological audit (as explained in Chapter 3) is an examination and review of a company's operations from the perspective of the new paradigm. The company is understood as a living system, and the theory of living systems is applied both to the conceptualization of the audit and to ecologically conscious (systemic) management. We shall therefore begin by reviewing a few salient features of living systems.

Systems thinking (as described in Chapter 4) involves a shift of perception from objects to relationships, from structures to processes, from building blocks to principles of organization. Living systems are integrated wholes embedded in larger wholes on which they depend. The nature of any living system derives from relationships among its component parts *and* from the relationships of the whole system to its environment.

The basic principle of organization that is characteristic of all life is the principle of self-organization (Capra). This means that the order and functioning of a living system is not imposed by the environment but is established by the system itself. In other words, self-organizing systems exhibit a certain degree of autonomy. Systemically oriented managers are well aware of this fact, recognizing the company's own logic and emotionality and trying to influence the system rather to control it.

The theory of self-organizing systems distinguishes between the system's structure and its pattern of organization (Maturana and Varela, p. 47). The pattern of organization is the totality of relationships that define the system's essential characteristics. This pattern can be described in an abstract way without referring to energy, physical substances, organisms, and so on, without using the language of physics, chemistry, or biology. The structure of a living system is the physical realization of the pattern of organization. The same pattern may be realized in different physical and biological structures, and these structures are described in the language of physics, chemistry, and biology.

This important distinction between structure and pattern of organization provides us with the basic conceptual tool for our eco-audit. Since the task of an eco-audit is to minimize the company's environmental impact, and since this impact concerns ecological processes involving energy, material substances, people, and other living organisms, we need to represent the company, a living system, in term of these processes. This means that we are

primarily interested in the structural aspects of the company, i.e., in the physical realization of its pattern of organization.

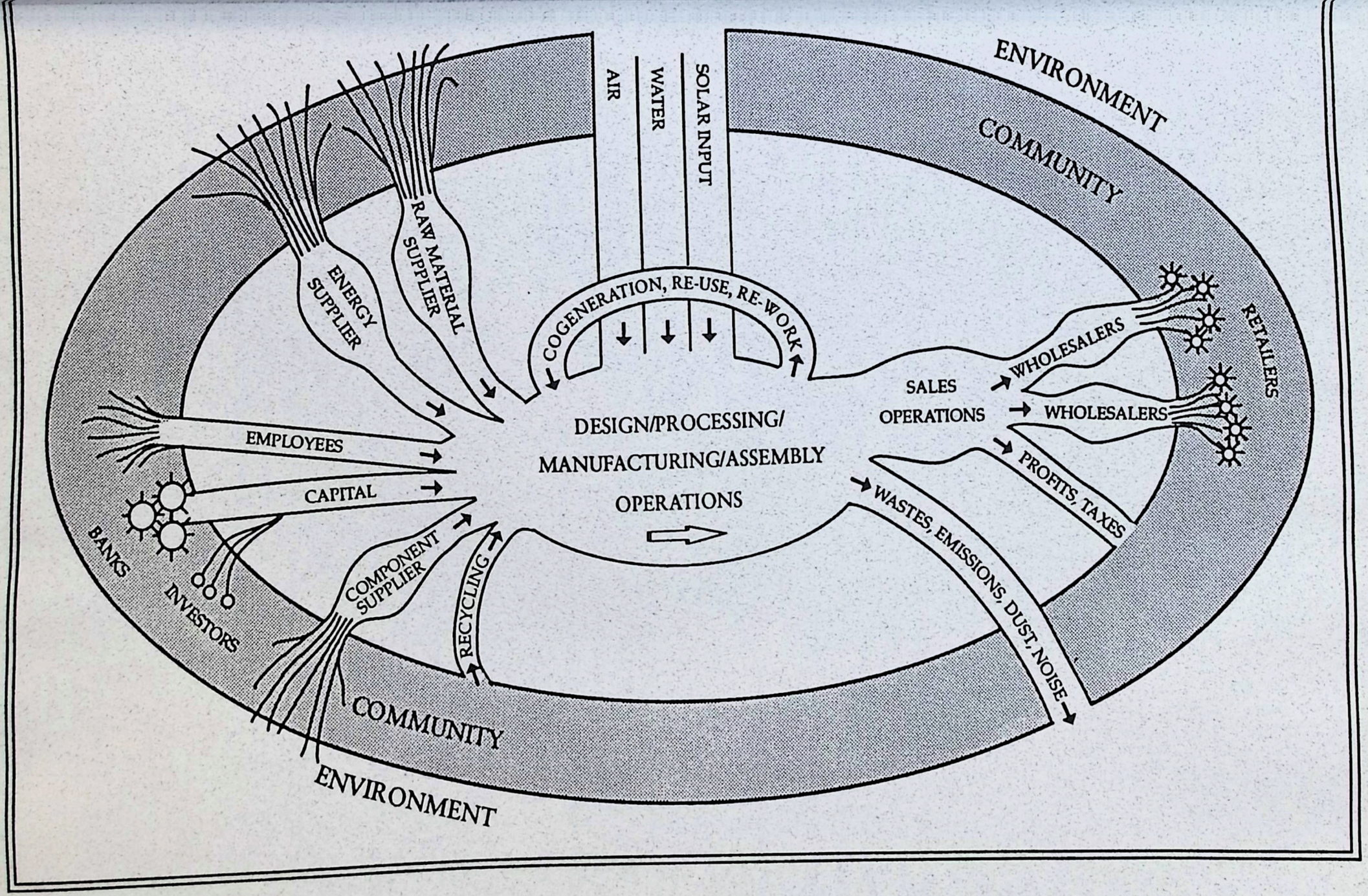
Metabolic Flow and the Organizational Chart

To represent these structural aspects in the form most suitable for an eco-audit, we designed a flow chart representing the "metabolism" of a prototypical company—the movement of materials, people, and energy from the outside, through the company, and back to the outside. Whatever its line of business—manufacturing of goods, provision of services, manipulation of information, etc.—the company will take things in, process them in various ways, and generate products and wastes. All these activities are placed visually along a metabolic flow in our chart, which is sufficiently general that it can be applied to companies irrespective of their central activity.

Because eco-audits are concerned with the consequences of flows of material, energy, and people, it is crucial in planning them and carrying them out to think clearly about this level of the physical realities of the company and its connections to suppliers, the community, the natural environment, etc.

The means by which this metabolism is coordinated and managed are part of the company's pattern of organization, which is represented to some extent in its organizational charts, though these do not always correspond to the actual responsibilities and functions of people in a company.

If the flow chart represents the company's metabolism, its organizational chart may be seen as representing its nervous system. It is desirable to use both kinds of charts for organizing an eco-audit. Both charts together give a visual and easily grasped representation of the company. They display the full complexity of a company's structure and its relationships with its social and natural environments, so that the planning of the eco-audit will not omit critical aspects of the company's operations.



SIMPLIFIED "METABOLIC" CHART OF A PROTOTYPICAL COMPANY

– 6 –

Eco-Audit of Metabolic Flow

Both traditional compliance auditing and more comprehensive eco-auditing make use of systematic checklists or protocols which are used to guide investigations of a company's activities. These have evolved over the past decade-plus in a rather disorganized manner, and a crucial part of this report has been to give more logical rigor to the way they are set up. We have drawn upon well-developed German work, particularly that of Georg Winter, but also upon American practice, and we have extended many of these lists through our own efforts. (In assessing some technical operations, considerably more fine-grained checklists are employed.) No set of checklists can pretend to be totally exhaustive, but we feel that use of the Elmwood Guide will ensure that no significant ecological aspects of a company's operations will be ignored. Which of these a company chooses to focus on or do something about of course depends on factors within that particular company, and will change as time goes on.

The checklists in this chapter are organized to be used in conjunction with the metabolic flow chart. A first group of checklists is connected with **Inflow**. Here we deal with energy inflows and ways they can be minimized; and with materials management, including relations with subcontractors or suppliers, whose activities often cause the bulk of a company's impact on the environment.

A second group of checklists deal with **Processing and Manufacturing**. The factors here are product design with "eco-friendly" criteria, including durability, sustainable use of raw materials, ethical product testing, minimal packing waste, etc. Here too are factors involved in manufacturing processes themselves and also recycling, both within the company and for products after consumers dispose of them.

We then move on to **Outflow**. Here the checklists focus on advertising and promotion and other marketing practices, and distribution systems. Since wastes and emissions are also a form of outflow, means to identify and minimize them are included here. Some wastes, of course, can be recaptured and either re-used or sold, which provides a back-loop on our chart.

Money, in the form of profits and investments by the company, can also be thought of as an outflow, but we have included it with a final group of checklists dealing with **Supporting Structures** that underlie and affect all aspects of the metabolic flow. Methods of handling

financial matters can have ecological implications, and they are dealt with here, along with questions of insurance. Then we turn to workplace considerations, not only physical working conditions such as safety, noise, and lighting, but work organization, cafeteria nutrition, and human relations; these factors make up the "habitat" in a company.

Other supporting structures involve transportation of materials and people into and out from the company, design and management of physical plant and office facilities (including ecologically beneficial landscaping), and emergency planning. Since so much business now involves international relationships, we provide a special checklist for ecological and social criteria there.

In all these checklists—some of which are really lists while others are written out in narrative form—we deal frequently with questions of implementation. But we also provide, as the last section of our report, coverage of how to set priorities in eco-auditing and how to plan a full audit. We rank priorities for action according to several scales—business considerations, ecological ones, personnel and organizational ones, and human and psychological ones. Needless to say, these different types of considerations may conflict, and difficult decisions about prioritizing may have to be resolved.

(1) Inflow

Checklist #1: Energy

Energy costs can decisively affect competitiveness. Looking at how energy is managed can sometimes generate new ideas for optimizing the manufacturing process.

1. Integrating an Energy Team into the Company Structure

A. Set up a project group (consider including randomly selected staff, volunteers, or rotating appointments) with employees from production, planning, purchasing and personnel. Make sure that employees' job descriptions include their function in this group.

B. If company is large, consider having additional energy project monitors responsible for particular areas, workplaces, workshops or departments.

C. Arrange meetings of top management with project group and an energy specialist who can help direct discussion on given topics.

2. Becoming Informed about Energy

A. Research and gather information on relevant energy-conserving technologies or products.

B. Brainstorm alternatives, conduct employee education workshops to solicit employee suggestions.

C. Conduct a model energy audit:

- Find which departments of the company consume most electrical or heat energy, and determine costs.
- Calculate the total cost of energy purchased from non-company sources.
- Discuss what financial savings are possible and the potential effects, especially employee benefits, of the proposed reduction measures. Make financial savings clear to top management and financial departments.
- Centrally collect and review audit data on a regular basis.

D. As appropriate, solicit new ideas, formulate new objectives and consider

new technologies for reducing energy consumption.

3. Implementing Short-Term Energy Measures

A. Consider making small-scale changes in the workplace, for example, installing temperature regulators, providing extra insulation for hot water pipes, frequently cleaning surfaces of heat exchangers and air conditioner filters for maximum efficiency, and so on.

B. Install state-of-the-art monitoring equipment, when economically feasible.

C. Use heat exchangers to recover exhaust heat, and consider recirculating exhaust heat into production processes or generation of electricity.

D. To reduce continuous energy use, establish optimal temperatures for water used in the company.

4. Implementing Long-Term Conservation Measures

A. Check whether large amounts of energy are required for manufacture:

—energy requirement per working hour,

—energy requirement per product unit.

B. Check whether consumption, use and maintenance by the user will involve high energy consumption or air, water or soil pollution.

C. Check whether materials used for the product will allow it to be easily integrated into the ecological and raw materials cycles. Pay special attention to the following:

—energy requirement for recycling (reuse),

—energy requirement for waste disposal.

D. Optimize energy-efficient design, bearing in mind all preliminary production stages and the energy required for disposal.

- Less weight saves energy.
- Ceramic elements improve heat insulation.

5. Communicating Progress

A. Inform employees of results in a report, and regularly in company newsletters.

B. Demonstrate energy savings achieved to interested groups both within and outside the department.

C. Inform other companies and media of successful practices.

Checklist #2: Materials

Raw material flows are vital to the global economy. Hence politics, technology, social organization, attitudes, economics and other factors of production are all essential in developing a systemic approach to materials management. Creative input from political scientists, global thinkers and others will be valuable for initiating a responsible policy.

The key to change lies in developing rewards for responsible suppliers and firms. Trust and loyalty between purchasing departments and subcontractors are crucial to a successful ecological program.

Since the materials eco-team will be involved in shaping innovative policies, and may require international producers to instigate large-scale change, this group needs the independence to evolve standards relevant to the company and its environment. It should also have the authority to network with other similar groups, and to direct purchasing departments to introduce its standards into contracts. To ensure compliance, this group must also be empowered to take such steps as testing sample materials in outside research labs, or sending unannounced on-site inspectors to work sites.

1. Fact Finding

A. Collect information on raw materials used by the company and its suppliers.

- Identify basic materials requirements for present production processes and products.
- Determine points-of-origin for imported materials.
- Note any special problems of in-house use of materials, such as hazardous or environmentally damaging characteristics under various possible conditions.
- Identify other characteristics of materials, such as associated labor savings.
- Produce separate costings for water used for different purposes, and cost distribution accordingly.
- Make sure the company is in compliance with federal, state and local laws regarding emissions, hazardous substances, etc.

B. Collect and evaluate information from suppliers about any materials you purchase from them.

- In particular obtain details of production processes, for example:

  —short-bath or long-bath process in the textile industry;

  —use of economical rinsing process in electroplating;

  —use of magnesium bisulfide process instead of calcium bisulfide process in paper manufacture.

- Ask for details about special ecological problems arising from disposal, or remobilization into the biosphere, lithosphere, and so on.
- Collect details about pollutants during use, e.g., pollutant volume and emission levels. A staff member should follow developments in legislation dealing with release of substances into air and water (see Wastes and Emissions Checklist).

  Ask for information on issues such as

  —Environmental effects of alternative raw materials;

  —Materials and labor savings of substitutes;

  —Workplace conditions in factories, mines, etc.

- Ascertain independently the reliability of information from suppliers, and check their business policy and economic status, the efficiency of transportation, etc.

C. Solicit and catalogue ideas from industries, non-profit environmental institutes, research laboratories, ecology journals, and where appropriate company engineering, research & development departments.

D. Centralize information on alternative products, raw materials substitutions, and new technologies, and make this information accessible to all employees, even those not involved in the materials eco-team.

E. At regular meetings, brainstorm ideal and contractual standards for basic environmental and social goals. The participation of outside consultants is strongly recommended.

2. Adopting Ecological Strategies and Practices

A. Improve on-site storage of raw materials.

- Label and restrict access to all hazardous substances.
- Apply ecological principles in designing and maintaining storage facilities, for example

  —low-exhaust fork-lift trucks

  —reusable containers

B. Install advanced equipment.

- Use modern painting equipment.

C. Improve efficiency

- Use catalysts and converters to improve yield from raw materials or reduce emissions.
- Use minimal amounts of cooling water.
- Install state-of-the-art automatic measuring and control technology.
- To monitor water use, install thermometers, expansion valves and flow reducers.
- Substitute rainwater rather than groundwater, if possible.

D. Recover/Recycle

- Always recover heavy metals, acids, and organic solvents.
- Devise techniques to facilitate raw materials recovery (for example, do not mix substances; in wet processes, reduce rinsing and cleaning water).
- Recycle rinsing and cleaning water.
- Recycle, recirculate or reuse useful substances in effluent or convert them into other useful products.
- Separate and reprocess industrial sewage water.
- Use grey water for toilet flushing.

E. Replace hazardous materials with less hazardous ones

- Replace cadmium coatings with zinc;
- Use low rather than high sulfur coal;
- Replace asbestos in brake and coupling linings;

- Replace chlorinated hydrocarbons in cold cleaning solvent;
- Replace PCB transformers.

F. Increase efficiency of international, national, inter-company transportation.

- Optimize routes and shipment schedules to avoid waste of resources.
- Favor transportation methods which have reduced environmental costs.

3. Component Parts Management

A. Conduct components inventory.

- Catalog product components for all manufactured products, and, as far as is compatible with trade secrets, for supplied products.
- Check whether components can be recycled:

—Transformers containing PCBs need special disposal;

—Fluorescent lamps contain dangerous metals and should be carefully returned to the manufacturer.

4. Negotiating with Suppliers

A. Specify new ecological and workplace standards in contracts with your suppliers/subcontractors, and communicate to them your corporate strategy or mission.

B. In negotiating contracts, detail exceptional circumstances, such as political repression or flagrant national disregard for human rights, which would make a region or nation unacceptable for your business.

C. Favor suppliers/subcontractors that meet your new standards and timetables, and show willingness to negotiate about longer-term goals.

5. Implementing More Ecologically Advanced Strategies and Practices

A. Stimulate markets for new sustainable technologies and less environmentally damaging production processes.

- For example, in mining, favor suppliers who have integrated processes of wastewater reclamation, erosion control, habitat restoration.

- In agriculture, favor suppliers who practice biocontrol, use minimal or no artificial fertilizers/pesticides, etc.
- Favor suppliers who use alternative fuels, energy, or transportation, that is less environmentally damaging.
- Encourage technologies and processes which foster ecological innovation and long-term sustainability.

B. Independently verify whether contract goals are being met by subcontractors.
   - Consider requiring bills-of-lading, certifications (if points-of-origin may be obscure), clearance certificates, quality analyses results.
   - Involve own engineering, research and development departments as well as independent labs to analyze dangerous materials and contaminants and to assess alternatives.

C. Form cooperative buying groups with similar companies in order to stimulate markets for environmentally responsible production.

(2) Processing and Manufacturing

Checklist #3: Product Design and Development

For long-term environmental changes to occur, ecological thinking must be introduced into the design and development stages of production. If the firm is large enough to have managers for each product line, give them a significant share of responsibility for the environmental impact of their product.

1. Catalog Current Products to Determine Which Could be Improved by Eco-Friendly Design.

A. Integrate ecological thinking into the evaluation of the full cycle of product conception, specification, production, use, re-use and ultimate disposition.

B. Research possible new uses for obsolescent products.

C. Make new products adaptable to foreseable improvements in science and technology.

D. Design parts to have multiple uses and to be useable in different products. To this end, aim for standardization of parts used.

- Make use of ASA/DIN standards

E. Provide room for additional components by avoiding integrated construction.

F. Make technical provision for enlargement of product capacity, include

- Capacity reserves
- Multiple connectors

2. Design Products for Effective Maintenance/Durability

A. Increase the functional life of products.

B. Store unfinished products so that wear and tear are minimized.

C. Design products to facilitate repair.

D. Avoid frequent design changes for stylistic and marketing purposes: make classic, durable design your trademark.

E. Especially avoid "disposable" products.

3. Make Sustainable, Ethical Use of Raw Materials in Design

A. Favor use of materials derived from sustainable systems of production (or from recycled products).

B. To facilitate recycling, consider whether constituent raw materials can be re-used or recycled, and how much energy is required for this process.

C. Avoid combining materials that are incompatible for future re-use/recycling.

- Avoid using aluminium cans with steel tops.
- Carefully select printing inks and dyes when using them on products destined for recycling.

D. Use fewer raw materials per product.

4. Product Testing

A. Establish guidelines for dealing with the issue of animal experimentation.

- Substitute computer modeling or cell culture for whole animal studies.
- If whole animal testing is essential, provide stringent guidelines for humane treatment of test subjects (e.g., press for alternatives to "sacrifice" of test individuals).
- Take an absolute position against testing on animals taken from the wild and of course on endangered or threatened species.

B. For aerodynamic products, use computer simulation or experiments to facilitate efficient design.

5. During Design Phase, Aim to Reduce or Eliminate Toxic Materials in Both Products and Production Processes

A. Find suitable substitutes for hazardous dyes and preservatives on paper, cloth, wood, etc.

6. Design for Consumer Health and Well-Being

A. Consider health of customers during design.

- Design apparel which complements the biological needs of the human body.
- Minimize or eliminate harmful preservatives, fats, trace contaminants, etc. in food products.

B. Make products easy to use, and include clear instructions, so as to mini-

mize risk of accidents and injury, and to prevent stress.

- Make machines as self-explanatory as possible.
- Use icon markings for control knobs, etc.
- Incorporate health warnings into the design of the product itself, on the side of a machine, on hangtags, on containers, etc.

C. Make provisions for those who fall outside the scope of normal marketing stereotypes in terms of weight, physical ability, linguistic fluency and literacy, etc.

7. Design to Minimize Social Problems

A. Reconsider whether it is ethical to reinforce racial, ethnic and sexual stereotypes (and innuendoes) in designing and selling products.

B. Do not make high expense and inaccessibility the selling point of products.

8. Respect Lifeforms and Ecosystems

A. Avoid using products or parts of animals taken from the wild, and especially endangered or threatened species.

B. Consider alternatives for the use of animal parts as raw materials.

C. With regard to plants, avoid supporting exploitation of endangered and threatened plant species, or deforestation/defoliation that endangers bioregions.

D. Consider introducing a high-prestige line of products which represents the culmination of advanced ecological thinking.

E. Consider using ecological and preservation themes in fabric patterns, decorative designs on products, etc.

9. Avoid Wasteful Packaging

A. Establish whether suppliers are able to use minimal returnable/recyclable/organically degradable packaging.

B. Use standardized packaging in order to make optimum use of transport and storage space.

C. Select the packaging material with the lowest energy input requirements.

D. Design packaging to be reusable, either as packaging or for other purposes.

E. Collect paper and cardboard for recycling.

F. Minimize use of plastics, styrofoam, etc.; consider popcorn and other biodegradable or recyclable materials.

Checklist # 4: Manufacturing and Production

1. Establish a Fact-Finding and Research Group

A. Analyze existing manufacturing processes and technologies.

B. Propose ecologically favorable alternatives in the short term.

C. Keep informed about relevant innovations (emerging technologies, new processes, and products) which would improve the company's ecological and social performance over the long run, even if expensive in the short term.

D. Make certain that company is complying with, or exceeding, existing environmental protection standards.

2. Improve the Ecological Performance of Existing Systems and Materials in the Short Term

A. Introduce additives and catalysts which will improve raw materials yield and/or reduce harmful emissions in manufacturing.

B. Increase energy efficiency by insulating, sealing or otherwise protecting equipment and materials to be used at high or low temperatures.

C. Check and repair all leaks in existing equipment used for circulating or storing gases and liquids (e.g., valves, pumps, pipes, shut-off devices).

D. Regularly check pollutant treatment equipment for proper operation and efficiency.

E. Reduce noise by isolating machinery, insulating and other means. (Provide employees with comfortable ear protection against noise.)

F. Reduce vibrations generated by equipment.

G. Make employee safety a priority.

- Provide basic employee training in first aid, workplace hazards, etc.
- Conveniently locate first aid equipment and stations (eyewashes/showers).
- Monitor employee health complaints for early indication of hazardous and toxic contact.
- On a voluntary basis, have blood and urine samples analyzed for employee uptake of hazardous and toxic chemicals.

3. Continuously Upgrade and Redesign Production for Long-Term Benefits

A. Replace hazardous chemicals with ones which pose fewer human health hazards and/or cause less pollution (also see Materials Checklist.) This will significantly benefit employees and the community.

- Find substitutes for known carcinogens and other major hazards.
- Do not store/use explosives or corrosives near toxics—this could create a costly environmental accident.

B. Upgrade with technologies which improve company's ecological and human health record (see also Wastes and Emissions Checklist).

- Favor technologies which give improved input and output ratio.
- Choose more reliable automatic measuring and control technologies.
- Install automatic monitors and warning systems for emergencies.

C. Aim to improve post-production, or "end-of-pipe," environmental protection equipment.

- Install sophisticated "scrubbers" for reducing hazardous emissions from air stacks.
- Adopt "Best Available Technology" as a standard.

D. Replace inefficient and highly-polluting energy systems with efficient ones which are less damaging to the environment.

- Use alternative sources such as solar and wind; investigate photovoltaics.
- Design systems to reuse process waste heat; consider co-generation. (See also Energy Checklist.)

E. Avoid intermediate storage by switching from discontinuous manufacture to continuous processes.

F. Adopt hermetic processes especially for dangerous dust-producing substances, such as asbestos and fiberglass.

4. Recover, Recycle, and Reprocess

A. Recycle or re-use effluents which contain useful substances (see also Recycling Checklist).

B. Responsibly recycle, reprocess, recover or, if necessary, dispose of wastes which contain harmful substances.

5. Responsible Manufacturing

A. Redesign manufacturing processes to eliminate unwanted substances from the production stream.

B. If a product is found to be manufactured or produced in an unsafe manner given current specifications, then redesign the product and/or production process.

C. If a product cannot be manufactured or produced in a safe manner under current specifications, then eliminate—or find suitable alternatives for—the product and/or its production process.

Checklist #5: Recycling

Recycling is a popular, labor-intensive strategy to mitigate some effects of raw materials exploitation. To be effective, strong markets for recycled component and finished goods must be stimulated. Ecologically conscious firms should therefore not only support these markets but also inquire whether or not materials designated for recycling are actually being reprocessed and for what products. Political influence should be used to promote government backing for use of recycled products.

1. Fact Finding

A. Set up a recycling management team—with representatives from product design, materials, purchasing and marketing, and independent specialists—to oversee and evaluate all recycling and use of recycled products. Ensure that the team is empowered to make necessary changes.

B. Note departments of the corporation which consume products that can be replaced by recycled products.

- Weigh costs of switching to the alternatives against the estimated environmental benefits; consider relative "visibility" of changes.
- Assess regional or large-scale environmental impact of particular recycling operations, and develop guidelines for deciding when recycling is appropriate.
- Consider especially the energy, labor and capital requirements of recycling, versus any pollutant effects of current disposal arrangements. Analyze consumer demand for the recycled product.
- Weigh the practical costs of recycling against estimated environmental benefit.

C. Ensure that recycled products are not hazardous to those who produce or use them; e.g., favor recycled paper that is free of dioxin.

2. Recycling in Production Facilities, Offices, Retail Outlets, and so on.

A. It is preferable that product design should facilitate recycling (see also Product Design Checklist).

- Use fewer or more easily separable raw materials.
- Standardize components.
- Avoid non-biodegradable materials.

B. Change mix of products or services, organizational structures, transportation or communication systems etc., to optimize recycling.

C. Recover raw materials and reduce waste in the production process.

- Using materials and components inventories, note any possibilities for recycling waste produce into own or external production.

D. Conveniently place and label recycling bins for selected materials.

E. Provide opportunities for employees to bring materials from home for recycling if they have no other alternative.

F. Bring in an outside contractor to facilitate recycling.

G. Within the company, substitute computer "e-mail" for typed paper memos and communications.

H. Educate customers (using product labels or hangtags) to emphasize recyclable components of products.

I. Offer customer rebates for recycling of your products (e.g., for returning worn cotton goods to become cotton rag paper).

3. Negotiating with Recycling Firms

A. Research and select firms that meet criteria determined by recycling management team, that seem willing to negotiate and are not owned by corporations with a history of mistreating the environment or employees.

B. To reduce costs, consider purchasing directly from firms which produce goods from recycled materials.

C. If possible, purchase recycled products from the same companies that recycle your waste.

D. Should your suppliers of materials and components be in a good position to recycle associated by-products, incorporate recycling requirements into contracts.

E. Negotiate optimal transport routes with recycling firms and other companies that recycle.

F. Make sure that your recycling firm is responsibly handling materials.

4. Implementing More Ecologically Advanced Strategies and Principles

A. Aim to stimulate the market for recycled products by informative advertising, displays in retail outlets, product labels.

B. Form computer information networks with other corporations about suppliers and recyclers, to facilitate flow of reusable and recycled materials.

C. Form computer information networks with other corporations about responsible recyclers and suppliers of recycled goods.

D. Progressively change product and package design in ways that make recycling easier (see also Product Design and Materials Checklists).

E. Increasingly try to use biodegradable substances in all your processes.

(3) Outflow

Checklist #6: Marketing and Sales

Marketing is comprised of the aggregate steps involved in getting your product to consumers. This includes how you promote, price, and distribute your products.

1. Set Up Teams To Evaluate and Reconsider Current Marketing

2. Promotion

A. Package Design (see also Product Design Checklist)

- Evaluate and reconsider current designs.
- In conjunction with the materials team, devise sensible packaging made from environmentally acceptable materials.
- Avoid over-packaging (i.e., using unnecessarily large containers or double wrapping).
- Consider developing packages which travel well but use minimal materials.
- Use "eco-seals" on your packaging to highlight your product's environmentally positive features. (See Global File Report #3.)

B. Sales

- Evaluate and reconsider current style.
- Provide information to your customer on the ecological benefits of your products.
- Provide post sales and advisory services to ensure that the product is used and disposed of in an acceptable manner.
- If higher prices cannot be avoided as a result of ecologically sound manufacturing processes, make it clear to distributors and consumers how the costs are calculated (discuss price differentials based on ecological factors).

- If you work through retailers, consider providing an 800 number (in the United States) to answer the final customer's questions about the ecological effects of your product.

C. Retailing

- Evaluate and reconsider current arrangements.
- Negotiate with your retailers to present your product in a manner which is in accordance with your ecological marketing strategy.
- If you feel your retailers are not in accord with the image you wish to promote, consider opening your own stores where you have more control over your company image and the presentation of your products and where you can more easily monitor consumer preferences.

D. Advertising

- Evaluate and reconsider current media/levels of effort.
- Avoid use of unecological advertising media (i.e., coated papers and toxic inks).
- Use "eco-seals" in your advertisements to emphasize the eco-friendly features of your product.
- If you use direct mail, avoid duplication in mailings; consider targeting different catalogs to different audiences.

3. Distribution

A. Evaluate and reconsider existing systems.

- Give preference to existing transport systems which have reduced environmental costs in terms of energy consumption and pollution.
- Research and support the development of more ecologically sound transportation systems.

4. Establish and Implement Strategy (based on above considerations)

A. Determine and target customer sectors most likely to be affected by advertising stressing ecological factors.

B. Prioritize products or product categories to promote in an ecological campaign.

C. Periodically monitor the success of the above strategies in economic terms and revise if necessary.

D. Work with the Public Relations group to monitor the company's profile with respect to these decisions and revise strategy if necessary.

E. Provide monetary bonuses or other incentives for achieving or surpassing targets.

F. Consider implementing (and publicizing) marketing or sales strategies which directly benefit environmentally or socially significant programs and/or projects.

- Designate a percentage of total company sales or profits for this purpose.
- Designate a portion of profits from a specific product line for this purpose.
- Consider including local and regional, as well as international projects in this category.

Checklist #7: Wastes and Emissions

Every part of a company creates pollution of some kind. Often, the various divisions produce very different types of pollution. Thus, you may find it useful to divide your teams into such categories as research and development, manufacturing, and office.

1. Set Up Teams to Evaluate 1) waste production and disposal and 2) emissions and emission controls

   A. Consider including both employees and representatives from other companies with specific technical knowledge of the processes producing waste and emissions as well as disposal arrangements and emission controls.

   B. Randomly select several team members from your employees to encourage creative solutions.

   C. Consider asking representatives from your suppliers, from other companies in your industry, and from your disposal companies to join your effort.

   D. Select several people who are well versed in legal and technical matters and would be able to knowledgeably investigate existing environmental laws with respect to emission controls, noise, toxic waste, water pollution, etc.

2. Identify Waste Products and Current Means of Disposal

   A. Specify the individual by-products (e.g., wood, paper, chemical compounds, asbestos).

   B. Note the origins of these by-products (production process, office waste, development waste), specifically indicating the process by which the waste is produced (i.e., the actual chemical and physical processes).

   C. Identify and rank the toxicity, lifetime, and general disposal problems of all waste (noting medical hazards to workers, land and water pollution, special disposal conditions for the item to biodegrade, etc.).

   D. Evaluate existing disposal arrangements, noting their effectiveness given the above ranking and their compliance with current laws.

3. Identify Emissions and Current Emissions Levels

A. Itemize all emissions emanating from your factories or buildings (including noise, gases, particulates, odors).

B. Indicate the origins of these emissions, noting the specific processes which produce the emissions.

C. Identify and rank the medical and ecological consequences of each emission.

D. Note emissions controls currently in place for each discharge, indicating inadequacies and degree of compliance with current laws.

E. Prioritize current emissions and control measures which must be changed.

4. Investigate Alternatives for Reducing or Eliminating Waste and Emissions

(Note: consider getting help or referrals from sources such as the Environmental Protection Agency.)

A. Use your two lists of priorities as a starting point for this investigation.

B. Seek other production methods whereby the creation of emissions and waste could be avoided altogether.

C. Seek alternative methods which would reduce their production.

D. Consider physical or chemical processes which would render the waste harmless (i.e., a mixture of methyl alcohol, formic acid, acetic acid, and ester heated to 900–1000 degrees Celsius will form carbon dioxide and water).

E. Consider whether any waste products could be used as raw materials for another production process within the company or could be sold to another company (in office situations, paper can be shredded and reused for packing materials or note pads).

F. Research more appropriate disposal methods (i.e., those with a higher degree of safety, or which would more readily cause the waste to biodegrade).

G. Rank each alternative in terms of its results, ease of implementation, and financial cost (paying particular attention to the possibility that a new method may decrease noxious emissions while yielding another harmful by-product).

H. Select alternatives to pursue immediately (those which are most urgent from your above lists of priorities followed by those producing the most results or costing the least).

5. Design a Strategy and Set Up Infrastructure to Support It

A. Devise an action plan (note steps to be taken, make a deadline, assign a task force and review committee which will ensure that environmental objectives are continually met).

B. For the long-term, assign an experienced staff member or consultant to continually inform your decision-makers of laws and regulations pertaining to environmental protection (make sure he or she provides you periodically with written reports).

C. Attend to all waste management systems:

- Provide conveniently located receptacles for storing by-products.
- Install collection points for used oil, solvents, solutions, acids, dyes, etc.
- Store toxic waste in well ventilated areas away from employees and heat.

D. Provide office containers for waste paper, plastics, glass, aluminum, and metals such as staples and paper clips and bottle caps [see also Recycling Checklist].

E. If you have your own retail store, establish recycling centers for your customers.

F. If you are the distributor, set up recycling channels for your customers.

6. Negotiate with Your Suppliers and Disposal Firms

A. Have supplier arrange for pick up of waste associated with his/her product (i.e., they pick up waste that they can re-use or have them contract with a local recycling company).

B. In your contract with suppliers, add a clause requiring them to provide full information on product characteristics and materials (this way the supplier is liable for misinforming you).

C. Make spot checks to be sure that disposal conditions are adequate (perhaps even form an organization with other clients which would monitor the disposal process).

(4) Structures Supporting the Flow

Checklist #8: Finance

As governments increasingly seek to shape corporate choices to minimize ecological damage, a great variety of financial implications are emerging. Thus tax write-offs are sometimes given for the adoption of emission-minimizing equipment; utility rates (and hence profits) are allowed to rise to finance energy-conservation measures; procurement policies are designed to favor ecologically desirable products such as recycled paper; the location of new or expanded facilities is subject to increasingly stringent environmental impact reports. Hence investment strategies must more and more be framed in terms of the ecological context.

In England and Germany, some government grants are available for certain kinds of environmental protection research or improvements. The German government offers various important tax advantages and low-interest loans. In the United States, industrial waste-water treatment may be eligible for federal grants, and some loans and grants are available from state sources. The European Development Bank in Luxembourg offers loans for investment in environmental protection, often on better terms than national banks. The Commission of the European Communities in Brussels offers funds for demonstration or model projects.

All investments should routinely be subjected to ecological evaluation; for example,

- Will it increase pollution?
- Will it increase ecological risks?
- Will it protect the environment?
- Will it protect the environment and also increase profitability?

The phasing of new investment can be ecologically sensitive. If a new lower-pollution technology is in the offing, it may be reasonable to delay replacement or fixes of the current generation of equipment, regulations permitting. Sometimes accelerated replacement of polluting equipment may be desirable.

If a particular investment is likely to cause or increase pollution, the financial dimensions of the costs and risks involved must be considered. Special factors that can be costly to ignore:

- Probable future costs for disposal of wastes
- Possible changes in regulatory thresholds
- Possible income from developing sales of by-products that would be pollutants if released

The "parking" of company funds can have ecological implications. Consider whether using banks within the company's bioregion will help keep capital local and thus foster local community strength, including environmentally desirable investments. Evaluate whether employee 401(k) or other corporate pension plans include environmentally and socially responsible investment options.

Traditional investment costing methods usually discriminate against long-term projects which bear most of their fruit in later years. So-called "dynamic" costing methods, i.e., the capital value method and the internal interest method, may be preferable.

Investing solely in end-of-the-pipe measures is generally far more expensive in terms of results than more systemic changes. Paying attention to only one troublesome aspect of a production process at a time, rather than the whole, is also generally needlessly costly.

The buying or selling of emissions allowances, while controversial among environmentalists, can have very large investment consequences. Specialists in "environmental property auditing" investigate potential ecological risks in the buying and selling of real property and corporations.

Insurance against massive ecological risks is being explored, sometimes through government, as with oil spills; it already exists for nuclear accidents (though on an extremely limited scale considering potential damages). In most European countries, national health services and other measures provide a certain basic "insurance" for employees and citizens. In special-risk industries such as mining and chemicals, companies sometimes provide accident and life insurance.

While normal liability insurance offers a good deal of protection for most business risks, the liability consequences of some industrial processes, as has been demonstrated by asbestos, can be immense and are seldom insurable; companies and their executives persist in them knowingly at great peril. Since the law is evolving rapidly in this area, a company using risky technologies must make it a high priority to keep abreast of developments.

Facilities insurance should be reviewed to ascertain its coverage of ecologically-related damage. Insurance also exists to cover interruption of production from such ecological causes as toxic spills.

Checklist #9: Investments

1. Establish and Eco-Investment Strategy

A. Determine ecological criteria you wish to follow in your investments

- Rank these criteria in terms of urgency to environment and society.
- Target your investments toward companies and governmental and non-governmental agencies which follow your ranking.

2. Making the Investments

A. Seek out investment institutions whose investment philosophies support your ecological criteria.

B. Use your "investor power" to move your own financial institution toward considering taking on more ecological investment principles.

- Think about purchasing local, state, or federal bonds supporting ecologically sound investment measures.
- Research potential eco-friendly investments (e.g., companies which need financing to make ecological improvements).

C. Justify your ecological investments to your stockholders.

D. Invest in your employees—provide incentive stock purchase plans and compensation benefits to reward improved ecological performance on all levels within the company.

3. Lobby for Eco-Investment Incentives

A. Organize a group to lobby for tax credits for specific environmental investments made by companies.

B. Support government or private aid for environmental improvements.

4. Support Community Organizations

A. Offer grants for organizations, local groups, and institutions involved in ecological or human-services projects.

Checklist #10: The Workplace

(A) Working Conditions

The internal environment of a company is of critical importance to the physical and mental health of everyone who works there, and hence to the overall welfare of the company. Indeed, since people in the company spend a large proportion of their waking hours in the company "habitat," working conditions there may be thought of as an important "product" which is consumed by these people, along with the products which are sold to customers outside the company. And working conditions include many factors besides those narrowly connected with work tasks.

Moreover, if stressful conditions of bad lighting or ventilation, noise, dust, toxics, or physical danger are not avoided, employees can hardly be asked to take a creative interest in general environmental matters. Internal and external environmental concerns are thus tightly linked, and need to be treated with an integrated approach.

Noise, including Low-Frequency Vibration

Noise from machinery can often be reduced, through cushioning or springs, shielding, sound-absorbent enclosures, venting to the outside, etc. Noise from subsidiary activities can also be severe and must be considered. Intermittent noises may be especially irritating and distracting. In general, noise can be contained by interposing continuous mass (no cracks or holes) between source and hearers, e.g., heavy plate glass or metal, concrete, etc. Structural isolation may sometimes be needed to prevent transmission of sound. Persons exposed to loud noise should use personal protective muffling equipment, and need regular medical check-ups.

Lighting and Colors

Minimum lighting intensities for different tasks are often prescribed by regulations. However, many other factors affect employee comfort and performance, some of which may also be subject to regulations: contrast ratios between light and dark areas, reflectance of surfaces, direction of light sources, etc. (For example, computer terminals require relatively low-level and indirect lighting.) Since employees are the best judges of their own lighting needs, they should be given considerable latitude in choosing and arranging light sources.

Fluorescent lamps, which are environmentally attractive because of their high energy efficiency, pose some special problems. Combining tubes of different light colors is desirable to approximate full-spectrum sun light, which is most comfortable for people; specially made tubes also achieve this, as do some bulb-shaped lamps. Flickering can be avoided by replacing worn-out ballasts, or using electronic devices or three-phase switching.

Colors in a work environment can have strong effects, but there is great debate over particular color effects; some "reds" are more restful than some "greens," for instance. It is generally felt that a light-colored ceiling seems higher than the same ceiling painted a dark color. A skillful decorator, in consultation with employees, will apply many such rules of thumb to producing a comfortable environment.

Electromagnetic Fields

Recent research has indicated that people (especially children and pregnant women) are affected by relatively low-level magnetic and electric fields, which are generated by much modern machinery (as well as by such devices as electric blankets) and pass through ordinary walls and floors. International attitudes vary in caution, and some researchers still believe that danger levels are very low or non-existent; but the level of concern among scientists has been rising steadily, leading to such considerations as: Video display terminals, which produce strong fields to the sides and rear especially, should not be grouped closely or in large numbers, and women who are pregnant or about to become pregnant should not work with them. Spaces near transformers or other equipment carrying large electrical currents, whether inside or outside of buildings, are not good places for people to spend large amounts of time. Facilities with human occupants should not be located under or near high-voltage transmission lines.

"Climate"

From the point of view of people's comfort, quiet natural ventilation is preferable to closed forced-air ventilation systems for much of the year in many climates; architects are learning how to use solar energy, natural wind input, buildings' capacities for heat-retention and -exclusion, etc., to produce structures whose energy consumption is modest even under quite severe conditions. Where closed systems are employed, particular attention is required for humidity, variations in air speed with respect to vents, drafts, temperature gradients between head and foot levels, etc. Radiative heat from warm surfaces can be a cause of discomfort, requiring attention. If heat generated by lamps, equipment, and human bodies cannot be dissipated through natural ventilation, solar-driven air-conditioning equipment can be considered.

Hazardous substances (See Checklist #7: Wastes and Emissions.)

Equipment

A large number of considerations bear on equipment design, and we can only suggest a sampling here: The principle of one-function, one-switch should be followed to minimize operator errors; emergency "off" switches should be clearly marked and easily accessible. Ergonomic design of all equipment should be the rule, to minimize fatigue. Equipment and work tasks should be designed to provide frequent interruptions of repetitive movements, to minimize physiological hazards; asymmetrical and excessive muscular exertion are to be avoided. Balance and variety are desirable between "private" areas or machines and those which are shared for tasks on which people cooperate.

Safety

Many work environments are inherently dangerous but safety precautions easily become part of the ignored "background." An audit can bring them to everybody's attention again. Danger signs and symbols (including color coding) should be reviewed. Protective devices and equipment may need to be installed or repaired, and in some cases workers under production pressure may have disabled safety devices—a sign that they require redesign so as not to inhibit production. Anti-dazzle and anti-spatter devices must be reviewed. Traffic routes should be defined and clearly marked to eliminate collisions of moving equipment and people. The wearing of necessary protective clothing or other personal equipment must be ensured. Areas around automatic machinery require particular attention; safety barriers or fences are needed to prevent people from entering dangerous areas, and if machinery can throw waste, parts, etc., possible trajectories must be guarded. Take particular pains with safety during periods of installation or maintenance, when normal safety equipment is dismantled or not yet in place.

Work Organization

The apparent advantages of a rigid assembly-line division of labor are often undercut by its human disadvantages: high absentee and error rates, employee dissatisfaction and rapid turnover. Developing a satisfactory internal environment is therefore inevitably concerned with the description and content of jobs. While every company's needs and possibilities are different, and employee "cultures" vary from community to community, certain principles are widely believed to help provide a healthy working environment:

- Organize operations so as to include teamwork; groups that have some degree of authority over how they collectively do their work are generally more efficient, creative, and contented.

- Responsibility for a task should always be linked with the authority required to carry it out.
- Avoid setting up work so that individuals' tasks are purely repetitive and/or rigidly timed.
- Avoid isolating individuals; everyone's work should involve considerable if intermittent contact with others.
- Avoid stress by making sure that demands on employees are not excessive in rapidity, strength required, precision of movement, etc.

Food

Meals eaten in company cafeterias often make up a major part of employees' diets, and are therefore important for the maintenance of health and productivity. Healthy eating patterns at work may carry over to home dietary practices. Moreover, a company's expenses for health insurance, as well as losses through medical absences, etc. can be reduced by improving its employees' overall health.

A company is therefore wise to provide a wide range of nutritional and health information to all employees. Basic and well established facts about the bad effects of diets high in fat, salt, and sugar should be made available through booklets, bulletin-board materials, and after-hours lectures to which spouses, domestic partners, and friends are invited. Some companies provide gyms or other exercise facilities (and conduct classes to augment individual alcohol and weight reduction programs). Others provide shower and changing rooms so that some employees can obtain desirable exercise by bicycling to work.

If an outside food concessionaire runs the company cafeteria, its menus should be nutritionally audited, and if it is unable or unwilling to make needed improvements, the company should consider operating its own kitchen. Having a kitchen on the premises generally provides fresher and more nutritious meals, better matched to the tastes of the employees. Edible wastes, if they cannot be avoided, can sometimes be donated to non-profit food kitchens. The surroundings in the cafeteria should be pleasant, with natural light, ventilation, and greenery. Plastic and "disposable" plates, cups, and utensils should be avoided or carefully recycled. Inedible food wastes should be composted for use on company landscaping.

People's feelings about food habits run deep, so improving the healthiness of cafeteria food (while preserving or encouraging ethnic as well as international tastes) needs to be accomplished by gentle stages, but it should include such basic goals as:

Lower fat and sugar content

More fiber content
More (fresh) vegetables and fruits

It can be helpful to label cafeteria dishes and foods with protein, sodium, calories and fat content as well as prices. Menus should provide sufficient alternatives for vegetarian employees. When breakfast is offered, it should include low-fat yogurt, oatmeal, whole-wheat rolls, and other alternatives to the "standard" high-cholesterol breakfast. Teas, including non-caffeinated or "herb" teas, should always be available.

Vending machines inside or around company facilities should also be reviewed, to make sure they offer fruit juices and low- or non-fat milk as an alternative to soda drinks and coffee, and nuts, sunflower seeds, and healthy snack bars as alternatives to candy bars and chips. If concessionaires are unable to provide these, the company should operate its own machines.

Household Counseling

While industry is the greatest single source of pollution, households are estimated to be responsible for around 30% of total environmental burdens. Encouragement of employee families to adopt less damaging practices is therefore of great importance: driving less, conserving water and energy, using alternatives to pesticides in the home and garden, using returnable containers and recycling paper, avoiding excessive packaging, etc. Excellent popular guides such as *Fifty Simple Things You Can Do To Save The Earth* contain handy tips easy to put into practice, and should be brought to the attention of all employees.

(B) Human Relations

Experienced and successful managers know that good relations with and among employees are essential to a healthy company. The literature on human relations in industry is extensive, and we offer here only a few observations that particularly relate to the company as an environment for the people who inhabit it.

A company's internal human environment cannot be considered in isolation from its community, any more than the company's wastes or emissions. Company policies on such basic matters as wage levels, child care, and family care leave, for instance, ramify throughout a community, producing either economic stress or economic comfort in families; these have major effects on performance of children in schools and later at jobs, and on levels of social services that need to be financed by the community. If relations with employees on the job are highly combative, it is unlikely that productive cooperation between the company and citizen groups partly made up of employees can exist. In recent

years many techniques for improving human relations and securing full cooperation between management and employees have been developed. Aside from the work-organization matters mentioned above, these include:

- Employee stock ownership as a means of giving employees a direct stake in the success of the company. This seems to work best when it is combined with some degree of employee representation in management. (In Germany, workers often have one seat on the company board of directors.) Customer and community ownership of stock might also be encouraged.
- Managing to promote cooperation rather than interpersonal competition; it has been demonstrated through hundreds of psychological experiments that people learn and perform better in cooperative situations (see Kohn).
- Mediation processes to resolve on-the-job problems quickly, without having to resort to official grievance procedures.
- Rewarding employees (and employee teams) for useful suggestions through substantial awards of money plus public attention.
- Evaluating corporate "social performance" on equal treatment of all employees irrespective of race, sex, ethnic identity, religious preference, sexual preference, physical health, and so on. Analyze relevant company statistics on employee hiring, promotion, compensation, etc. Educate all employees about problems such as sexual harassment and racial stereotyping.
- Developing cooperative working relationships with unions and regulatory agencies on such matters as health and safety.

Checklist #11: Transportation

1. Implement Anti-Pollution and Energy Saving Measures in the Short Term

A. Use unleaded fuel. Consider propane, natural gas, or electric propulsion for equipment such as fork-lifts and pickup trucks.

B. Safely dispose of used anti-freeze and other hazardous substances; recycle used engine oil.

C. Consider improving maintenance and retrofit options on company vehicles.

- Keep vehicles well tuned to reduce emissions and increase energy efficiency.
- Retrofit older vehicles with improved exhaust and noise control devices.
- If company vehicles need air conditioner servicing, have it done by a shop with "vampire" equipment to capture CFCs.

D. Choose asbestos-free brake and clutch plates.

E. Consider purchasing retreaded tires.

F. When purchasing new vehicles,

- Inquire about energy-efficient vehicles, fitted with advanced exhaust and noise-control devices even if not legally required in your country.
- Make safety a priority: include options such as airbags, automatic seat belts, etc.
- Request information on ecological and health effects of different paints used on vehicles.

G. Support or offer partial payment for driver-efficiency courses for employees.

- Recommend unaggressive driving:

  —reduces fuel use

  —reduces noise pollution

  —lessens stress for the driver

2. Reduce Unnecessary Transportation

A. Analyze travel schedules of employees in all departments.

- Co-ordinate events to minimize travel, especially cutting down on jet travel which causes air pollution in the stratosphere.
- Rely on faxing rather than courier services when appropriate.

B. Consider purchasing more supplies locally.

C. Consider subsidizing employees who are willing to live nearer their place of work.

3. Support Efficient Transportation

A. Plan movement of goods and components internal to the company to optimize energy efficiency.

B. Consider using electric vehicles, taking into account environmental damage caused by the generation of the electricity.

C. Provide bicycles and/or motor-scooters on for on-site trips.

D. Buy vans to be shared by employees who commute.

E. Reward employees who use alternative transport such as carpooling, vanpooling, mass transit.

- Provide free parking in areas where parking spaces are few or costly.
- Consider paying substantial sums to employees who form carpools.
- Give rebates on expenses for employees who use public transit; provide company site for selling of reduced-price tickets.
- Provide free shuttles to and from local public transit stations.

Checklist #12: The Physical Plant and Its Environs

1. Site Selection

A. Inspect the site and official environmental data to determine what pollutants might be present.

B. Evaluate site in terms of potential "natural" risks from active geological faults, floods, radon gas, etc.

- If occupying site, take risks into account when planning buildings and open spaces.

C. Research regional pollution problems that might endanger employees, e.g., nearby nuclear plants, oil refineries.

2. Design/Redesign Buildings for Well-Being of Users (see also Workplace Checklist)

A. Take account of topography and climatic conditions in fixing ecologically efficient design.

- Position work space for efficient heating-cooling.
- Install appropriate energy-efficient window coverings.
- Upgrade insulation.

B. Plan internal organization and working procedures so that one workplace does not adversely affect another (noise, dust, fumes, chemicals, electro-magnetic radiation).

C. Use human health and energy-economy criteria in planning heating, air-conditioning and ventilation systems.

- Hire professional firm to conduct an initial air quality audit so that some potential problems can be eliminated by increasing fresh air flows.
- Monitor employee complaints and illness (even blood and urine samples if volunteered) to help identify so-called "sick building syndrome." Act quickly to identify and resolve interior pollution problems.
- Select openable windows.
- Aim to use energy systems that allow employees to set temperatures local to their workplace.

D. Daylight in all workplaces, corridors and stairways is preferable to artificial light.

E. Create an aesthetic workplace, giving employees a say in the decor, and providing for ethnic and cultural difference.

3. Building Materials and Interior Maintenance

A. Select interior materials that do not pose a health risk.

- Avoid new furnishings or carpets that release formaldehyde or pesticide fumes.
- Make cautious use of wood that has been impregnated with volatile preservatives.
- Favor relatively problem-free paints.

B. Remove or seal all asbestos or other similar health hazards if present.

C. Avoid using wood from depleted species such as teak or mahogany; rely on species suited to sustainable production.

D. Choose natural local materials when possible.

E. Seek alternatives for interior pesticides, rodenticides; warn employees in advance if spraying is anticipated.

F. Choose cleaning supplies which minimize or eliminate exposure to hazardous substances.

4. Transforming the Landscape

A. Design or retrofit building to respect the local landscape and nearby architecture.

B. Extend foliage areas by planting vines on trellises or walls, for shade and energy-saving as well as pleasing appearance and habitat development.

C. Reduce energy requirement for building by planting windbreaks of fast-growing trees and shrubs.

D. Increase energy efficiency by planting deciduous trees near south-facing windows.

E. Warn employees if and when pesticides or herbicides are used on the grounds.

- Seek alternatives to chemicals for weed and rodent control; investigate Integrated Pest Management techniques.

F. Create a tranquil outdoor space in which employees can relax.

- Consider foot and bicycle paths, single and multiple seating accommodations, pleasing visual and fragrant surprises, wind and weather monitors, seasonally varying landscapes, etc. Consider ponds or fountains (with recirculated water).

G. Consider allocating vacant land for neighborhood residents to create gardens—if food plants are to be grown, check beforehand for possible contaminants.

H. Even if on a small scale, designate a portion of the site for a wild open space. Employ habitat restoration techniques in these areas. On substantial properties, hire local restorationists to reestablish appropriate indigenous ecosystems.

- Intersperse plants which supply foods, such as berries or fruits, for local wildlife.
- Sow wildflower meadow for color and nectar.
- Design special niches for animals, lizards, toads, butterflies, etc.
- Create dense thickets to provide protection for wildlife.
- If appropriate, construct bird houses or nesting platforms.
- Reintroduce rare natives as specimen plants if they can be protected.

I. To reduce water consumption and gardening labor costs, use indigenous plants for landscaping.

J. If certain areas on company property are especially suited for wildlife, designate these as "habitat preserves."

- ponds
- stream beds
- marsh areas
- dry washes and intermittent creeks
- hillocks
- rocky outcrops
- "natural" corridors or congregation areas for insects, birds, lizards, mammals, etc.

K. Check site for historic or archaeological features and make them a special point of interest.

5. Planning for On-Site Environmental Emergencies

A. Develop an environmental accident response plan (evacuation procedures, backup energy and water supply, first aid, radio and phone links, etc.) due to

- severe earthquakes
- tornadoes, cyclones, hurricanes
- chemical explosions
- hazardous waste spills
- floods
- fires
- toxic fume emissions

B. Educate employees about their responsibilities (and suitable safety equipment) in the event of emergencies.

C. Schedule drills for different eventualities.

D. Install automatic emergency monitoring and shutdown technologies for operations which involve potentially hazardous substances.

E. Provide emergency drains or catchment tanks to contain overflow effluent due to accident.

F. Install automatic alarm systems to alert employees and nearby community of accidental pollutant releases or other dangers requiring immediate response.

G. Include neighbors in emergency planning.

Checklist #13: International Business Relations

Environmental and social legislation functions most effectively within countries where the spirit as well as the letter of the law can be relatively well understood. By contrast, in international contexts where cultures and values diverge, the system of laws and conventions tends to break down. There is a global economy, but no simple mechanism for ensuring global responsibility. As a consequence, international business relations need special attention from an ethical standpoint.

The following Elmwood Institute principles can serve as a base for formulating international corporate goals.

- awareness of global interdependence
- peace and nonviolence
- human rights
- social and economic justice
- personal and social responsibility
- decentralization of economic and political power
- cultural diversity
- post-patriarchal consciousness
- ecological wisdom

Social and legal conditions, economic resources, and cultural factors must be considered in developing international corporate conventions, but should not overwhelm ecological and humanistic aims.

1. Establishing Goals

A. Brainstorm ideal standards for basic environmental and social goals for overseas production sites. Various United Nations Educational and Cultural Organization (UNESCO) materials may help in defining ethical relations among disparate cultures.

B. Collect information on goods produced or consumed (in whole or in part) in foreign countries.

2. Respecting Community

A. Develop knowledge about the history and culture of foreign areas where you do business.

B. Respect the local architecture, food, language, and culture.

C. Reconsider your advertising, selling and marketing strategies.

- Be sensitive to the problem of racial, class, ethnic, religious or sexual stereotyping.
- Be sensitive to the problems created by introducing nonsustainable lifestyles which may be disruptive to the community.

D. Respect cross-cultural differences in the way people organize and shape their relations with the biophysical environment.

3. Negotiate Standards

A. Aim to use foreign producers who apply labor and safety standards comparable to, or better than, those maintained for similar activities in the home country.

B. Write new materials, components and labor standards into contract with existing subcontractors.

C. Favor reliable suppliers who express a willingness to negotiate and are sympathetic to the corporate vision.

- Verify by periodic on-site checks that subsidiaries and subcontractors are maintaining standards.

D. Develop guidelines for disinvestment or economic boycott of businesses operating in countries whose governments flagrantly disregard international environmental, civil or social standards.

4. Implementing International Standards (See also the Materials Checklist.)

A. Goods intended for export should meet or exceed the standards for protection of the environment and human health applied to comparable domestic products.

B. Aim to pay comparable, fair, and nonexploitative wages to all employees in subsidiary and subcontracted operations.

C. Avoid meddling in local politics.

D. Incorporate International Labor Organization conventions regarding wages, hazards, unionizing, race and gender discrimination into contracts; require that these be met or exceeded by firms in all signatory and non-signatory nations.

E. Aim to eliminate categories or race, gender, ethnicity, religion, etc., as discriminating factors in employment, promotion, compensation.

F. Do not use countries with lower legal standards as a repository for dangerous production processes or wastes.

G. Provide employees and consumers concise information on how to use, transport, store and dispose of goods to minimize negative environmental or human health consequences.

- Provide technical training or information about products that are intrinsically dangerous.
- Label hazardous products in the language of the country of use.

H. Restrict or discontinue products if this becomes necessary for the protection of the environment or the health of the community.

5. Bioregional Considerations

A. Study applications to foreign operations of concepts such as:

- Sustainability
- Biodiversity
- Appropriate Technology
- Culture

6. Resources

A. In your strategy sessions, consider whether extreme concentration of economic and political control over resources is a desirable outcome.

B. Support sustainable resource economies.

C. If you incorporate small scale crafts economies into your operations, do so in a fair manner.

7. Respecting Life

A. Boycott trades (ivory, turtle shell, and other goods) that depend on endangered, threatened or otherwise rare species, e.g. elephant and walrus, green sea turtles, rhinoceros, etc.

B. Find substitutes for goods obtained through technologies and techniques (such as drift nets) which are unnecessarily destructive to wildlife or habitat.

8. Implementing More Advanced Ecological Strategies and Practices

A. Centralize information on alternative sustainable production processes in fisheries, agriculture, forestry, etc.

B. Stimulate markets for new sustainable technologies.

C. Communicate ecologically successful practices and technical improvements in production processes to other companies (unless economically unfeasible).

- Consider forming co-op buying groups.

D. Start a computerized network of information among ecologically conscious corporations.

E. Publicize your efforts to become ecologically and socially responsible, in your catalog, brochure, company newsletter, annual report, and to interested environmental organizations.

– 7 –

Action Plan: Priorities and Planning the Audit

Priorities in Ecological Management/Auditing

In planning a company's approach to ecological management, it is not possible or desirable to do everything at once. Developing ecologically sound practices in a company will require years of consistent effort, carefully planned and put into effect with good business judgment. Here are some priority considerations that can help to organize a business plan.

Business Priorities

These dictate paying attention first to legal requirements, then to steps that will save the company money or increase profits, then to steps that are neutral economically, and finally to measures that may be a burden on the company or are of high risk in that connection.

Ecological Priorities

The Environmental Protection Agency has recently rated the worst ecological problems facing the world as follows (*Science*, 10 August 1990; the rank order is not of great significance):

- Global climate change
- Stratospheric ozone depletion
- Habitat alteration
- Species extinction and biodiversity loss
- Air pollutants (e.g. smog)
- Toxic air pollutants (e.g. benzene)
- Radon gas
- Indoor air pollution
- Drinking water contamination
- Occupational exposure to chemicals
- Applications of pesticides

It can be reasonably argued that company actions that may affect endangered species and the biology of large areas (e.g. rainforests) can have irreparable consequences, and should thus be first in line. (Where company activities have disturbed wildlife habitats, restoration work should be undertaken.) The elimination of CFCs is also a very high priority. Discharges that affect air quality or drinking-water aquifers also require priority attention, and in some cases indoor air quality in plants (or even offices) may present surprisingly severe risks. Possibilities of catastrophic accidents are also very high on the list for individual companies, followed by health hazards on the job or in the neighborhood of company facilities, which can have grave legal, economic, and public relations aspects. Emergency and evacuation plans, drills, etc. should be worked out and publicized (along with earthquake plans in seismic areas).

The public ranks toxic waste problems at the top of its ecological worries, along with nuclear hazards, oil spills, acid rain, and other concerns. While these issues are not rated as overwhelmingly important by the EPA science committees, they do of course require attention from the industries in question.

On the next level of importance, turn to considerations of cutting water, energy, and raw material use in present processes. After that attention can be given to process inputs: using

more ecologically desirable materials. Processes themselves can then be altered, by adopting different technologies, or improving existing ones. Emitted substances and heat, etc. can be redirected, recycled, or reused. Once that is accomplished, residual detrimental materials (and noise) can be contained and managed for the protections needed to avoid special clothing or equipment for employees.

Personnel and Organizational Priorities

It is best to begin in departments of the company whose employees are already interested in ecological improvements. When new staff are being hired for any department, their environmental knowledge should be taken into account. Environmental managers should be people who are qualified in ecology, business economics, and psychology. In large companies, it is unwise to set up a massive centralized bureaucracy for ecological matters; self-regulating ecological units throughout the company with some central coordination, are a better ideal, but require real and lasting commitment from top management. Through proper training and motivation, all managers in the company should become ecologically minded.

Human Health and Psychological Priorities

From a social standpoint, first in line are health hazards, which can have grave legal, economic, and public relations aspects. For example, restrict the use of carcinogenic pesticides, consider alternatives to formaldehyde-laden new carpets in the office, and monitor any toxins which are stored, used, created, or released by the company. Good corporate citizenship requires vigilance with regard to the health of the employees and the neighboring community.

Give priority to habit-forming or example-giving steps: adopting recycled toilet paper and office stationery sends a message to all who use them. Use human-interest stories to dramatize the importance of ecological measures. When steps are taken with dramatic and rapid positive effects, such as the adoption of energy-efficient lighting, make sure all employees are aware of the benefits to the company. Try to move first on matters where a consensus exists among employees, e.g., for dust reduction, and later on matters where there are strong divisions of opinion, e.g., (in places where no public health regulations yet exist) about providing smoke-free conditions for non-smokers.

Planning The Audit

As with any activity in business, careful planning is essential if eco-auditing is to be successful. It is important that the people organizing and carrying out the auditing work share an understanding of the auditing process: its objectives, its methods, and its relation to company policies and structures. This process must also be explained beforehand to the company departments which will be examined during the audit.

Experienced people in the field, including the EPA, view the audit process as an orderly series of actions and conditions, all of which are necessary if the audit is to be productive. These are summarized below. (For large companies, a written description of the auditing process is necessary, both for the auditing teams and the auditees.)

1. Definition of audit program objectives and scope.

Some audits, especially in the U.S., have the easily defined objectives of ensuring that manufacturing units are in compliance with emission limits or other regulations. As eco-auditing objectives become broader, all aspects of a company's operation may be examined, and questions raised about company operations may seem to infringe on general management matters. Such broadening of scope is therefore probably best accomplished in stages, accompanied by ample educational work within the company. It is also important to define whether an audit is a one-time activity, or to be repeated on some regular basis, or even a continuing normal activity within the company. Such questions as confidentiality and custody of the audit report, its distribution, and the relation of the legal department to the audit process must be settled before work begins. The auditing team should have a clear understanding of whether they are expected to make recommendations or merely state facts. A time line for the audit process must also be established.

2. Top management commitment to the program.

As we have emphasized earlier, if strong support is not forthcoming, the audit program will almost certainly be ineffective. Written policy statements approved at the top are one indication of support, but informal signs are equally important: being involved in top-level reporting loops, receiving frequent attention from top managers, and having problems dealt with speedily and thoroughly. The long-term success of an auditing program is

closely linked to its ability to involve lower-level personnel in achieving ecological objectives; this can only happen if top management is genuinely and persistently interested. It must also be kept in mind that auditing reports which describe problems can even become a liability for a company if management does not support prompt remedies for the problems.

3. Independence of auditors from audited activities.

Since auditing, especially of the compliance type, may involve criticism of company people, the auditors must have independent status within the company (or as outside consultants brought into the company). To ensure objectivity, if company employees are used as auditors, they should not be expected to audit activities they formerly supervised, or currently have a connection with. Some tension between auditors and auditees is normal, as in financial auditing; but experienced auditors are skilled at avoiding a posture of blaming. They understand the auditees' point of view and help to develop a cooperative atmosphere for positive solutions that will help the company and all its component parts.

4. Proper staffing and training.

Auditing work often demands considerable depth of technical knowledge, and a familiarity with industrial processes and practices. The auditing team must thus be chosen to possess credible competence in the required areas. If further specialized expertise is required on occasion, the auditing team should know where to find it. In companies where in-house auditing capacity is being established, staff members can join the professional associations of environmental auditors that are developing (see Appendix A), perhaps enter training programs, and develop personal contacts to take advantage of the large body of collective experience that is being built up. The level of quality in auditing work should thus rise steadily. Consultants may also be engaged periodically to help assess the auditing process.

5. Formal audit procedures.

Auditing teams customarily prepare protocols, questionnaires, checklists, and other aids in organizing their work. This is part of the necessary planning and preparation process and must not be scanted. Much of an auditor's work is time-consuming: interviewing, checking of records, inspection of facilities, and sometimes obtaining laboratory tests. The necessary time for such work must be provided for in the audit budget.

6. Reporting.

Auditing teams usually report informally on their findings during the audit "field work," sometimes verbally and sometimes through transmitting working papers to the managers involved, as a basis for discussion meetings. During these discussions, misunderstandings can be corrected, solutions to problems that have been recognized may be developed, or alternative possible actions laid out. These can then be incorporated into the final report which the auditors deliver to top management; such reports often reflect a consensus on the problem involved. (More detailed material may be included in reports to facilities managers.) Sometimes responsibilities for corrections or improvements are indicated in the final report, so that later follow-up checks are facilitated. A closing conference based on the report is generally the conclusion of the audit process.

7. Quality assurance.

Like any business activity, the auditing itself needs scrutiny to insure its quality. Some checks should be carried out during the process by the auditing team; some, involving the auditees, should be done not long after. Others can be done periodically. A textbook, *Environmental Auditing Quality Management*, by Ann C. Smith and William A. Yodis, may be helpful in the audit-planning and evaluation process (see listing in Bibliography).

NOTES

1. See Global File Report #1, *The Development of Ecologically Conscious Management in Germany* by Rüdiger Lutz and Global File Report #3 on *Product Eco-Labelling* in West Germany and other countries by Ernest Callenbach.

2. Company profiles of most of these companies can be found in Steger, *Umwelt Management;* Otto Versad is profiled in *Der Spiegel*, April 1990.

3. "Environmental Management of The Body Shop International," internal report, July 1990.

4. These methods are more fully detailed in F. Senn's Ph.D. dissertation, "Ecological Business Management" (cited in Steger, 1988).

5. See A.D. Little, *Environmental Auditing*, 1987.

6. To elucidate, promote, and facilitate this shift is the very purpose of the Elmwood Institute. To do so the Institute makes a variety of resources available to its members—books, journals, newsletters, audio- and videotapes, discussion circles, etc.

7. The first three chapters of this Part draw heavily from Georg Winter et al., *Das umweltbewußte Unternehmen* (München, C.H. Beck Verlag, 1989) and to some extent from the English version, *Business and the Environment* (Hamburg and New York, McGraw-Hill Book Company, 1987).

BIBLIOGRAPHY

Bauer, Raymond A., "The State of the Art of Social Auditing," in Meinholf Dierkes and Raymond E. Bauer, eds., *Corporate Social Accounting*, Praeger, New York, 1973, pp.3–42.

Brown, Lester, *Building a Sustainable Society*, W.W. Norton, New York, 1981.

Brown, Lester et al., *State of the World*, W.W. Norton, New York, 1990.

Cahill, Lawrence B., ed.: *Environmental Audits*, 5th edition, Government Institutes, Inc., 966 Hungerford Drive #24, Rockville, MD 20850, 1987.

Callenbach, Ernest, *Product Eco-Labelling*, Global File Report #3, Elmwood Institute, Berkeley, 1990.

Campbell, Monica E. and William M. Glenn, *Profit from Pollution Prevention, A Guide to Industrial Waste Reduction & Recycling*, Pollution Probe Foundation, 1982 (available from Pollution Probe, 12 Madison Avenue, Toronto, Ontario, Canada M5R 2S1).

Capra, F., A. Exner and R. Königswieser, "Changes in Management—Management of Change: The Systemic Approach," Elmwood Institute working paper, n.d.

Capra, Fritjof, *The Turning Point, Science, Society, and the Rising Culture*, Simon and Schuster, New York, 1982.

Coalition for Environmentally Responsible Economics, *The 1990 CERES Guide to the Valdez Principles*, CERES, Cambridge, MA, 1990.

Corcoran, A. Wayne and Wayne E. Leininger, Jr., "Financial Statements—Who Needs Them?" *Financial Executive*, Vol. XXXVIII, No. 8, August 1970, pp. 34–48+.

Deal, Terrence E. and Allen A. Kennedy, *Corporate Cultures, The Rites and Rituals of Corporate Life*, Addison-Wesley, Reading, MA, 1982.

Devall, Bill and George Sessions, *Deep Ecology*, Gibbs M. Smith, Layton, Utah, 1985.

Dyllik, Thomas, *Ökologisch bewußte Unternehmungsführung: Der Beitrag der Managementlehre*, Swiss Association for Ecologically Conscious Management Ö.B.U., Postfach 9, 9001 St. Gallen, Switzerland, 1989.

Edwards, Todd C., *Annotated Bibliography on Environmental Auditing*, unpublished manuscript, September 1989, 8th edition, rev. 1, available from the Regulatory Innovations Staff, Office of Policy, Planning and Evaluation, U.S. Environmental Protection Agency, 401 M Street, SW, Washington, D.C. 20460.

Edwards, Todd C., *Industrial Environmental Management: An Annotated Bibliography of Practical Sources*, draft of unpublished manuscript, August 1989, 2nd edition, available from the Regulatory Innovations Staff, Office of Policy, Planning and Evaluation, U.S. Environmental Protection Agency, 401 M Street, SW, Washington, D.C. 20460.

Eisler, Riane, *The Chalice and the Blade*, Harper & Row, San Francisco, 1987.

Elkington, John, *The Environmental Audit, A Green Filter for Company Policies, Plants, Processes and Products*, SustainAbility Ltd. and World Wide Fund for Nature, 1990 (available from SustainAbility Ltd., 49 Princes Place, London W11 4QA, United Kingdom).

Elkington, John, *The Green Capitalists, Industry's Search for Environmental Excellence*, Victor Gollancz Ltd., London, 1987.

"Environmental Action at Smith & Hawken in 1990," unpublished manuscript, April 1990, updated July 1990.

Environmental Auditor, Vol. 1, Nos. 1-3, 1989.

"Environmental Management of The Body Shop International," internal report, July 1990.

Earth Works Group, *Fifty Simple Things You Can Do To Save The Earth*, Earthworks Press, Berkeley, CA, 1989.

Fox, Warwick, "Deep Ecology: A New Philosophy of Our Time?," *The Ecologist*, Vol. 14, No. 5-6, 1984.

Greeno, J. Ladd, Gilbert S. Hedstrom, and Maryanne DiBerto: *Environmental Auditing: Fundamentals and Techniques*, 2nd edition, Arthur D. Little, Inc., Cambridge, MA, 1987.

Harrison, L. Lee, ed.: *The McGraw-Hill Environmental Auditing Handbook: A Guide to Corporate and Environmental Risk Management*, McGraw-Hill, New York, 1984.

Henderson, Hazel, *The Politics of the Solar Age*, Doubleday, New York, 1981.

International Chamber of Commerce, *Environmental Auditing*, Paris, ICC Publishing S.A., (available from the International Chamber of Commerce, 38 Cours Albert 1er- 75008, Paris, France) 1989.

International Labour Office, *Summaries of International Labour Standards*, International Labour Office, Geneva, 1988.

Kohn, Alfie, *No Contest: The Case Against Competition*, Houghton-Mifflin, Boston, 1986.

Kreikebaum, Hartmut (Hrsg.), *Integrierter Umweltschutz, Eine Herausforderung an das Innovationsmanagement*, Betriebswirtschaftlicher Verlag Dr. Th. Gabler, Wiesbaden, 1990.

Lutz, Rüdiger (Ed.), *Sanfte Alternativen*, Beltz, 1981.

Lutz, Rüdiger (in collaboration with Fritjof Capra), *The Development of Ecologically Conscious Management in Germany*, Global File Report #1, Elmwood Institute, Berkeley, 1990.

Maturana H. and F. Varela, *The Tree of Knowledge*, Shambhala, Boston, 1987.

Müller-Wenk, Ruedi, *Konflikt Ökonomie: Ökologie*, C.F. Müller, Heidelberg, 1980.

Oberholz, Andreas, *Umweltorientierte Unternehmensführung, Notwendigkeit, Einführung, Erfolge*, Frankfurter Allgemeine Zeitung GmbH, Frankfurt,1989.

Pfriem, R. (ed.), *Ökologische Unternehmenspolitik*, Campus, Frankfurt, 1986.

Pieroth, Elmar and Professor Dr. Lutz Wicke, *Chancen der Betriebe durch Umweltschutz, Plädoyer für ein offensives, gewinnorientiertes Umweltmanagement*, Rudolf Haufe Verlag, Freiburg, 1988.

ReVision, The Journal of Consciousness and Change, Special Issue: *Critical Questions about New Paradigm Thinking*, Summer/Fall 1986, Volume 9, Number 1.

Roberts, Leslie, "Counting on Science at EPA," *Science*, Vol. 249, 10 August 1990, pp. 616-618.

Schreiner, Manfred, *Umweltmanagement in 22 Lektionen*, Gabler, Wiesbaden, 1988

Sietz, Manfred and Rainhart Michahelles, *Umwelt-Checklist für Manager*, Eberhard Blottner Verlag, Taunussteing, 1989.

Smith, Ann C. and William A. Yodis, *Environmental Auditing Quality Management*, Executive Enterprises, Inc., 22 West 21st Street, New York, N.Y. 10010-6904, 1989.

Steger, Ulrich, *Umweltmanagement, Erfahrungen und Instrumente einer Unweltorientierten Unternehmensstrategie*, Frankfurter Allgemeine Zeitung GmbH, Frankfurt, 1988.

United Nations Environment Program, *Industry and Environment* special issues on *Environmental Auditing*, October/November/December 1988, Vol. 11, No. 4 (available from the UNEP Industry and Environment Office, Tour Mirabeau, 39-43 quai André Citroën, 75739 Paris cedex 15, France).

Winter, Georg et al., *Business and the Environment, A Handbook of Industrial Ecology with 22 Checklists for Practical Use and a Concrete Example of the Integrated System of Environmentalist Business Management (the Winter Model)*, McGraw-Hill Book Company GmbH, Hamburg and New York, 1989.

Winter, Georg et al., *Das umweltbewußte Unternehmen, Ein Handbuch der Betriebsökologie mit 22 Check-Listen für Praxis*, C.H. Beck Verlag, München, 1987.

APPENDIX A

Several textbooks focused on compliance auditing have been prepared to raise the level of general expertise in the field. The most recent and authoritative known to us are, in order of probable usefulness to most companies:

J. Ladd Greeno, Gilbert S. Hedstrom, and Maryanne DiBerto: *Environmental Auditing: Fundamentals and Techniques*, 2nd edition, Cambridge, MA: Arthur D. Little, Inc., 1987.

Ann C. Smith and William A. Yodis, *Environmental Auditing Quality Management*, Executive Enterprises, Inc., 22 West 21st Street, New York, N.Y. 10010-6904, 1989.

L. Lee Harrison, ed.: *The McGraw-Hill Environmental Auditing Handbook: A Guide to Corporate and Environmental Risk Management*. New York: McGraw-Hill, 1984.

Lawrence B. Cahill, ed.: *Environmental Audits*, 5th edition, Government Institutes, Inc., 966 Hungerford Drive #24, Rockville, MD 20850, 1987.

The following organizations and institutions (in alphabetical order) have been disseminating information and/or carrying out training programs for auditors. Inclusion here does not signify an endorsement by The Elmwood Institute.

American Institute of Environmental Property Auditing, c/o Theodore Nearing, 1311 West 96th Street, Suite 250, Indianapolis, IN 46260-1173, tel. 317-633-4000.

Environmental Audit Forum, c/o Mr. Vinay Dighe, Occidental Petroleum, 10889 Wilshire Blvd., Suite 1160, Los Angeles, CA 90024.

Environmental Auditing Roundtable, P.O. Box 23798, L'Enfant Plaza Station, Washington, D.C. 20026-3798.

Institute of Environmental Auditing, P.O. Box 23686, L'Enfant Plaza, Washington, D.C. 20026-3686.

Institute of Environmental Sciences, 940 E. Northwest Highway, Mt. Prospect, IL 60056.

APPENDIX B

The Valdez Principles

from *The 1990 CERES Guide to the Valdez Principles*

Introduction

By adopting these Principles, we publicly affirm our belief that corporations and their shareholders have a direct responsibility for the environment. We believe that corporations must conduct their business as responsible stewards of the environment and seek profits only in a manner that leaves the Earth healthy and safe. We believe that corporations must not compromise the ability of future generations to sustain their needs.

We recognize this to be a long-term commitment to update our practices continually in light of advances in technology and new understandings in health and environmental science. We intend to make consistent, measurable progress in implementing these Principles and to apply them wherever we operate throughout the world.

1. Protection of the Biosphere

We will minimize and strive to eliminate the release of any pollutant that may cause environmental damage to the air, water, or earth or its inhabitants. We will safeguard habitats in rivers, lakes, wetlands, coastal zones and oceans and will minimize contributing to the greenhouse effect, depletion of the ozone layer, acid rain, or smog.

2. Sustainable Use of Natural Resources

We will make sustainable use of renewable natural resources, such as water, soils and forests. We will conserve nonrenewable natural resources through efficient use and careful planning. We will protect wildlife habitat, open spaces and wilderness, while preserving biodiversity.

3. Reduction and Disposal of Waste

We will minimize the creation of waste, especially hazardous waste, and wherever possible recycle materials. We will dispose of all wastes through safe and responsible methods.

4. Wise Use of Energy

We will make every effort to use environmentally safe and sustainable energy source to meet our needs. We will invest in improved energy efficiency and conservation in our operations. We will maximize the energy efficiency of products we produce and sell.

5. Risk Reduction

We will minimize the environmental, health and safety risks to our employees and the communities in which we operate by employing safe technologies and operating procedures and by being constantly prepared for emergencies.

6. Marketing of Safe Products and Services

We will sell products or services that minimize adverse environmental impacts and that are safe as consumers commonly use them. We will inform consumers of the environmental impacts of our products or services.

7. Damage Compensation

We will take responsibility for any harm we cause to the environment by making every effort to fully restore the environment and to compensate those persons who are adversely affected.

8. Disclosure

We will disclose to our employees and to the public incidents relating to our operations that cause environmental harm or pose health or safety hazards. We will disclose potential environmental, health or safety hazards posed by our operations, and we will not take any action against employees who report any condition that creates a danger to the environment or poses health and safety hazards.

9. Environmental Directors and Managers

We will commit management resources to implement the Valdez Principles, to monitor and report upon our implementation efforts, and to sustain a process to ensure that the Board of Directors and Chief Executive Officer are kept informed of and are fully responsible for all environmental matters. We will establish a Committee of the Board of Directors with responsibility for environmental affairs. At least one member of the Board of Directors will be a person qualified to represent environmental interests to come before the company.

10. Assessment and Annual Audit

We will conduct and make public an annual self-evaluation of our progress in implementing these Principles and in complying with applicable laws and regulations throughout our worldwide operations. We will work toward the timely creation of independent environmental audit procedures which we complete annually and make available to the public.

Contact CERES at: 711 Atlantic Avenue, Boston, MA 02111, USA.

The Elmwood Institute is an international think tank founded in 1984 by Fritjof Capra, author of *The Tao of Physics* and *The Turning Point*. It was formed to facilitate the cultural shift from a mechanistic and patriarchal world view to a holistic and ecological view. Its purpose is to nurture new ecological visions—based on awareness of the fundamental interdependence of all phenomena and of the embeddedness of individuals and societies in the cyclical processes of nature—and to apply these visions to the solution of current social, economic, environmental, and political problems.

Leading holistic thinkers and activists such as David Brower, Hazel Henderson, Jerry Mander, and Charlene Spretnak form its network of Peers and Council Members; the provocative *Elmwood Newsletter* is their forum. Elmwood programs include Global File, reports on successful ecological practices in business and government worldwide; symposia and conferences and Elmwood Circles.

For membership information, please call: (415) 845-4595; or write to: P.O. Box 5765, Berkeley, CA 94705.